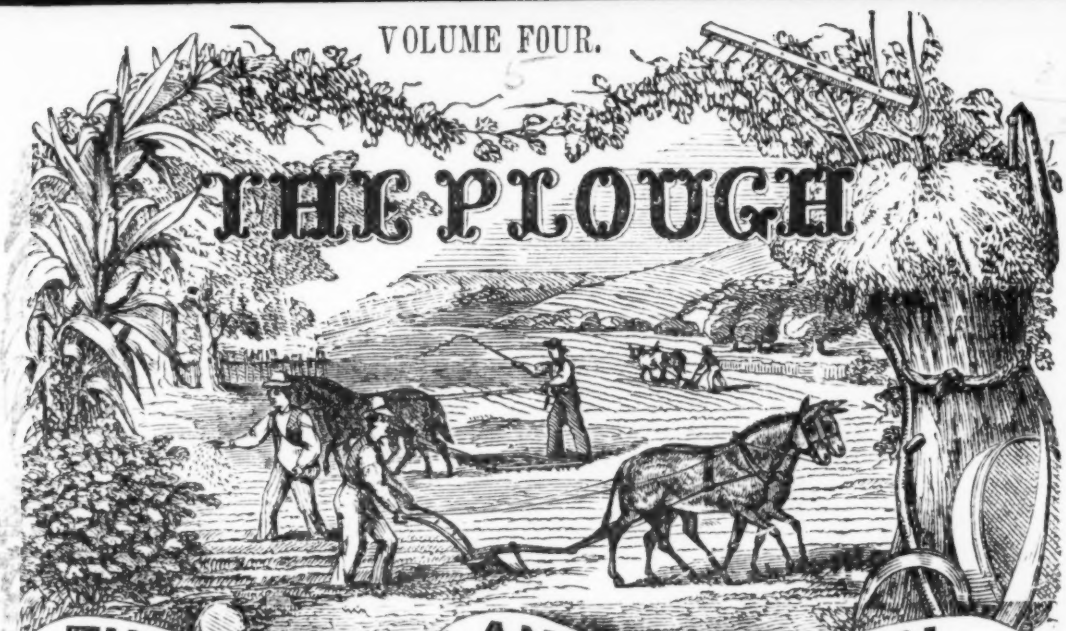
VOLUME FOUR.

THE PLOUGH



THE LOOM AND THE ANVIL.

F. G. SKINNER AND MYRON FINCH, EDITORS.

A MONTHLY PUBLICATION
OF SIXTY-FOUR PAGES,
DEVOTED TO SCIENTIFIC AND PRACTICAL AGRICULTURE—MANUFACTURES—MECHANICS—NEW INVENTIONS—A SOUND PROTECTIVE POLICY—FARM BUILDINGS—COTTAGE DESIGNS—FRUIT TREES—FLOWERS—GARDENING—BEES, CATTLE, HORSES, HOGS, SHEEP, POULTRY, &c.

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Henry B. Lamy

The Plough, the Loom, and the Anvil.

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THOSE of our readers who are familiar with Mr. Carey's work, *The Past, the Present, and the Future*, will recognize in the following article a portion of one of its chapters. We have been frequently urged to lay it before them, as containing the most satisfactory explanation of the cause, throughout the Union, of the extraordinary tendency to dispersion. Men are every where flying from each other, scattering themselves over large surfaces, when each and every one of them is fully aware that his labor would be rendered doubly productive by increased facility of combining his efforts with those of other men. They fly from each other, that all may become producers of food, when each man knows that land and labor increase in value as the consumer of food takes his place by the side of its producer. Desirous to exhibit to our readers the explanation of the causes of these remarkable phenomena, we have obtained from the author a copy of this paper, revised and corrected to the present time; thus exhibiting a view of the effects of the tariff of 1846, in arresting the progress of the nation towards that highest point of real grandeur, indicated by the existence in perfection of the power of self-protection of the people, each among his neighbors, and of the nation among the community of nations.—ED. P., L., AND A.

THE REAL GRANDEUR OF NATIONS.

THE population of the United States is by the late census above twenty-three millions; and the surface comprised within the existing States and territories considerably exceeds a million of square miles, containing probably seven hundred and fifty millions of acres, each of which is capable, at a moderate estimate, of feeding a full-grown man; and were it properly cultivated, it would clothe him too. The surface, then, that is already organized, is capable of maintaining seven hundred and fifty millions of people, or three fourths of the whole population of the globe; and yet men are seen, by thousands and almost tens of thousands, removing to Oregon and California to appropriate more land, of which they must cultivate the drier and less fertile soils; while behind them are left fertile lands covered with the finest timber, almost utterly valueless because the cost of destroying the timber would be more than the land would sell for when cleared—and other lands underlaid with marl and lime that would at the smallest cost of labor fertilize them for centuries.

For the benefit of the rich lands from which man thus flies, his predecessors have labored during more than a century. For their benefit, they have made roads, railroads, and canals—have built houses, and towns, and cities—and he can purchase them, with all their advantages of timber and soil, at the price sometimes of even sixty cents an acre, or one twentieth of the interest they have acquired in these improvements: yet he flies from them to commence the work of cultivation upon distant land that has no value, and that can never acquire any but from the labor that he himself bestows upon it. He flies from rich lands, that he may have at far less than cost, to obtain poor ones at full cost; and a heavy cost it is. He flies from the neighborhood of rich bottom lands, covered with manure that has there accumulated

for ages, and that he may have for little more than the labor of clearing them, while men near towns and cities pay thousands of dollars a year for the manure yielded by the produce of poor lands cultivated by him and others like himself.

The natural tendency of man is to combine his labors with those of his fellow-man. He knows that two can roll, and four can lift, a log, that one alone could neither roll nor lift. Here, however, men are seen flying from their fellow-men, each one seeking to roll his own log, for lift it he cannot. The labor of each is thus wasted on the road. The manure of his horses is wasted on the road; and his labor is unprofitably employed at the end of his journey.

The natural tendency of man is to combine his axe with his neighbor's spade, lending one and borrowing the other. Here, however, the man with the axe flies from the man who has a spade.

The natural tendency of man is to begin on the thin soil at the side of the hill, and to work down towards the rich soil at its foot, gathering manure on the latter with which to enrich the former; but here man flies from the rich soils near him, to seek the poor ones distant from him.

The natural tendency of man is to combine with his neighbors for improving old roads, but here man flies to a distance that he may employ his labor on new ones, while the old ones remain unimproved; and henceforth two are to be maintained instead of one.

The natural tendency of man is to combine with his neighbors for improving the character of education in old schools; but here he flies from his neighbors to places where there are no schools, and where there can be none until he shall build it himself.

The natural tendency of man is to hold in regard old places and old churches, mellowed by time and sanctified by the recollection of those who had before inhabited them; but here he flies from them, to cut out new places in the woods, whose harshness and hardness are quintupled by the recollection of the places he has left, occupied by the friends of his early years.

Why is this so? Why is it that men should fly from western New-York, where railroads run through rich lands, covered with dense forests, and through swamps that need drainage alone to give to cultivation the richest soils in the world, to seek the West, where they even now cultivate poor soils distant from market, yielding but ten or twelve bushels of wheat to the acre, and that small yield, too, annually decreasing* because of the necessity for starving the great machine, by wasting on the road the manure yielded by the horses or oxen employed in the work of transportation: while the wheat itself is consumed abroad, leaving nothing whatever to return to the land? Why is it that throughout that rich country, with its canals and railroads, its towns and its telegraphs, population diminishes, and land concentrates itself in fewer hands: always the signs of diminishing wealth?

Why is it that men fly the fertile valleys and rich slopes of northern New-York, near neighbors to both the St. Lawrence and Lake Champlain, where steamboats abound, to seek the shores of Lake Superior, there to obtain from the drier and less fertile soils, that *always must be* first cultivated, a reward of little more than five or six times the seed? Why is it that rich meadow-lands on the Schuylkill remain unimproved, while men seek Oregon and California? Why is it that vast forests still cover fine meadow-lands on the Susquehanna, capable of yielding crops whose *tons* would number more than the *bushels* ob-

* See Report of Commissioner of Patents, January, 1845, p. 25.

tained from the wheat lands of Ohio, and furnishing manure in tons for fertilizing the poor soils of the hills, on which now stand farm-houses in the midst of farms that have been in cultivation for half a century? Why do men seek Iowa, to raise from an acre thirty bushels of Indian corn, that before it can reach market must be converted into pork, while the lower lands of Virginia and Maryland are abandoned—lands that are nearer to market, and from which, by careful cultivation, a hundred bushels might be obtained? Why is it that men fly from the meadow-lands of South Carolina, leaving the remaining inhabitants a prey to fevers and malaria consequent upon diminished population, to seek the thin land of Texas, at the heads of the streams; there to raise small crops to be wagoned over half-made roads down to new towns, possessing none of the conveniences that tend so greatly to diminish the friction between the consumer and the producer? Why is it that men are everywhere seen flying from their fellow-men—from those destined by the Deity to be their helpmates—from parents and relations—from old houses, and old churches, and old school-houses—old comforts, and old feelings—and from all the conveniences and advantages that tend so largely to promote their happiness and their respectability, and to increase their powers of exertion—to seek in Texas and Iowa, Oregon and California, new homes and new relations, amidst woods that they cannot fell, and swamps that they cannot drain, and upon the drier and less fertile soils that yield, invariably, the smallest return to labor?

These things would seem almost impossible: yet if we turn to India, we may see the poor Hindoo cultivating the poorest soils, and then laboring, almost in vain, to drive through the rich black clay that lies between him and his market the half-starved cattle that bear his miserable crop. Here we have the same state of things; and both here and there it may be traced to the same cause—*necessity*. In neither can men exercise *power* over the rich soils, because *in neither have men power over themselves;* and until they shall have it, they must continue to fly from the neighborhood of rich soils capable of yielding tons, by aid of whose manure poor soils might be enriched, to poor soils becoming daily poorer, because to them even the manure yielded by their own little product cannot be returned. They borrow from the earth, and they do not repay, and therefore it is that they find an empty exchequer; performing thus the process that farmers are enabled to avoid, when, as in England and New-England, the consumer takes his place by the side of the producer. Therefore it is that the average produce of New-York is but fourteen bushels of wheat to the acre, while that of Ohio is even less, although acres may readily be made to yield forty or fifty bushels; and therefore it is that the average produce of Indian corn is but twenty-five, when it should be a hundred bushels, and that of potatoes but ninety when it might be four hundred bushels.

If we desire to understand the cause of these extraordinary facts, we may, perhaps, obtain our object by taking a bird's-eye view of a farm-house of western Pennsylvania, near neighbor to the rich meadow-land above described. The farmer is reading the newspaper, anxious to know what are the crops of England, and whether or not the rot has destroyed the potato crop in Ireland. Four years since many of the people of Europe starved; but he sold his crop at a good price, and paid off his debts. This year he wishes to purchase a new wagon, and to add to his stock of horses, but, unhappily for him, the farmers of England have had a favorable season, and the rot has not appeared in Ireland. Starvation will not sweep off its thousands, and he will get neither horses nor wagon.

His eldest son is preparing to remove to the West, to raise wheat and corn

in Wisconsin or Iowa, and to send to the already overstocked markets increased supplies of food. His daughter is grieving for the approaching loss of her brother, and of her sweetheart, the son of the neighboring wool-grower, who is about to leave for Michigan to raise wool, that he may compete with his father, who, on his part, is studying carefully the newspapers in hopes to see that the sheep of Australia have rotted off and thus diminished the supply of wool. He desires to pay off his debts, but this he cannot do, unless the price of wool should rise, and thus increase the difficulty of obtaining clothing. Why do these sons move off? It is because there is no demand for labor. All the land is held in large farms, because the swamps are undrained and the heavily timbered land is uncleared, and the less fertile soils alone are cultivated; and farmers that would live at all must farm and fence in a great deal of land, where a dozen bushels to the acre are considered a good crop. Why does he not clear some of the meadow-land? It is because there is no demand for milk, or for fresh meat—for hay, or turnips, or potatoes—or for any of those things of which the earth yields largely, and which from their bulk will not bear carriage to distant markets. He knows that when the great machine yields by tons, the product is worth little unless there be mouths on the spot to eat; but that when he restricts it to bushels, the product may be transported to the mouths. There is no demand for timber, for all the young men fly to the West, and new houses are not required. The timber is valueless, and the land is not worth clearing to raise wheat, almost the only product of the earth that *will* bear carriage. To clear an acre would cost as much as would buy a dozen in Iowa; and the product of four acres, at ten or a dozen bushels each, would be equal to one of forty or fifty bushels. He therefore goes to the West to raise more wheat, while his friend goes to raise more wool; and his sister remains at home unmarried. Why does she not marry, and accompany her lover? It is because she has found no demand for her labor, and has earned no wages to enable her to contribute to the expense of furnishing the house.

Here, then, we have labor, male and female, superabundant for want of wages with which to buy food, and clothing, and houses—food superabundant, for want of mouths to eat it—clothing material superabundant, for want of people to wear it—timber superabundant, for want of people desiring to build houses—fertile land superabundant, for want of people to drink milk and eat butter and veal—and poor land superabundant, for want of the manure that has for ages accumulated in the river bottom; while the men who might eat the veal and drink the milk produced on rich lands, are flying to the West to waste their labor on poor ones: *those who should be consumers of food becoming producers of food.*

Why is this? It is because they have no market at which the labor, male and female—the food and the wool—can be exchanged for each other. They want a woollen mill, and had they this, the sons would stay at home and consume food, instead of going abroad to produce more. The daughters would marry, and would need houses. The timber would be cleared, and the fertile lands would be cultivated. The manure would be made, and the poor lands would be made rich. The milk would be drunk, and the veal would be eaten, and the swamps would be drained to make meadows. The saw-mill would come, and the sawyer would eat corn. The blacksmith, the tailor, the hatter, and the printer would come, and all would eat corn. The town would grow up, and acres would become lots. The farms would be divided, and the fencing of each diminished. The railroad would be made, and the coal and iron would come; and with each step in this progress, the farmer would obtain a better price for his corn and his wool, enabling him from year to year

to appropriate more and more labor to the development of the vast treasures of the earth; to building up the great machine, whose value would increase in the precise ratio of the increase in the return to his labor. The more he could take out of it, the more it would be worth.

The good people of this neighborhood now use bad machinery of exchange. They send to market annually five thousand tons of food and wool, one half of which is absorbed by the horses, and men, and machines, required for its transportation, conversion, and exchange; and thus they pay annually as much as would be required for the erection of a place of home exchange. The amount thus spent is lost for ever. The following year the same expenditure is needed; and the next, and every succeeding one. The same labor once applied at home, would stand, and in the following year the wagons, and horses, and men would be at work upon the farms, clearing richer lands, and carrying manure to the old ones; and with every year new combinations would arise—new and better lands would be cleared—new houses would be needed—new demands for timber would arise—new marriages would take place—new children would be born—and with each step in the progress of population and wealth, men would become richer and happier, and land would be more divided, and farms would be better cultivated, and schoolmasters and preachers would be better, and man would acquire more power over land and over himself.

Let us now take a similar view of one of our planting friends in the South. His cotton is half picked, but early frost has come and killed the rest. Why is this? He had not hands to pick it. Why had he not? Because throughout the year there is no demand for labor. His best lands are uncleared, because there is no demand for lumber. His meadow-lands are undrained, because there is no demand for milk or veal. He raises bushels of corn, when he might have tons of turnips or potatoes. He wants a place of exchange for labor, food and cotton—a cotton mill. His neighbor is going West to the light soils of Texas, leaving the rich soils untouched. He is going to raise more cotton. If he stayed, he might be a consumer of corn, and cotton, and milk, and veal, and beef.

If we now ask the worthy planter why he does not clear the rich land close to the poorer soil that he now cultivates, his answer will be, that he has offerred twenty or thirty dollars an acre for clearing it, and destroying the timber, but in vain; nobody will undertake it. Nobody needs timber. There are no houses wanted, for his neighbors are flying to poorer and more distant soils. There are no railroad sills needed, for the production of the neighborhood diminishes, and men will not make roads except when production increases. If we look in upon him at his hours of leisure, we shall find him intent upon the last news from England; desiring to know how many mills are closed—how many are working half time—how many operatives have been discharged to starve—and wondering within himself if a time will ever arrive when it will be possible to calculate upon a continuance of the same state of things in that country during any single half year. If we look in upon him when meeting with his neighbor planters, we shall find them discussing the expediency of restricting the culture of cotton; or of holding conventions for the purpose of determining how much shall be grown, with a view to acquire some *power* over their own actions, and thus to diminish their *necessities*—but all in vain. Each successive arrival brings with it the news of a further reduction in prices, yet no means can be devised to bring the supply down to the demand; and yet his neighbor goes to Texas *to raise more cotton.*

He and his neighbors send annually to market four thousand bales, of which

the chief part is swallowed up by the men and the horses and machines employed in the business of transportation and exchange. They send five thousand bales of cotton to get in exchange one thousand bales of cloth. Two thousand bales would build a place of exchange for labor, and corn, and cotton; and the new machinery of exchange would stand. Thenceforward, the produce of hundreds of these bales would go upon the land, and newer and better soils would be cleared—and labor would become more valuable—and wages would rise—and men would marry, and houses would be needed, and children would be born—and land would become divided—and the planter would in time become the landlord of happy tenants, cultivating their own little farms for their own advantage; and thus it is slaves would become free, while their masters would become rich, and only as they became rich.

If we desire to see this process in full operation, we must turn our eyes towards New-England. The best soils are there cultivated, because there is a market on the spot for those productions which our great mother earth supplies in such profusion that they will not bear carriage to distant markets. The Yankee can take tons from the land, and he can return tons of manure back to it, because he uses the best machinery of exchange. He concentrates his population by tens of thousands upon the poor soils of Massachusetts and Rhode Island, and there he consumes the corn raised by the people of the West, and places on his own thin soil the manure with which they part. His soils double in productive power, while theirs fall off. He becomes rich and richer every day, by concentration. They remain poor, and then they scatter themselves over new thin soils, to repeat in Iowa and Oregon the process of exhaustion already so well commenced in New-York, Virginia, and Ohio.

If we desire to see it elsewhere, we must turn to Eastern Pennsylvania. Under the tariff of 1842, population was there concentrating itself in the coal and iron regions; and what was the result? She had ceased to be a corn-exporting State. Her miners ate the wheat of Michigan and Iowa. Her farmers were then clearing richer land. Houses were needed, and mine-props were needed, and railroad sills were needed, and boat timber was needed, and in every spot, for fifty miles around the coal region, the farmers were felling their trees, which yielded them the means of draining their meadows, while the demand for milk, and beef, and veal, and potatoes, and turnips, and all those vegetable products that the earth yielded in greatest abundance, enabled them to grow rich themselves and to make their poor soils rich. She had ceased to be a rival to Ohio or Wisconsin in the market of the world, and, therefore, their products were more valuable; and with the increased value of their productions, the planter of Mississippi or Alabama was enabled advantageously to devote more of his land to raising food, and less to raising cotton, the effect of which has since been seen in the increased price of the latter. Since then the coal trade has become stationary, and many of the mines have been discontinued. The iron trade has been diminished one third, and many of the furnaces have been abandoned. Her people have been and are now dispersing themselves over the West, to become producers of food, instead of consumers of food, and more planters will now raise cotton, and fewer will now raise food; the result of which is about to be seen in the fall in the price of cotton.

Such was the effect of a trade of six millions of dollars, the establishment of which had required fifty millions of dollars. Two millions more would have put up fifty furnaces, capable of producing two hundred and fifty thousand tons of iron, the producers of which would have eaten as much food, occupied as many houses, and worn as much cloth, as those who had been set in motion by the fifty millions already expended. In the fashioning of the

great machine, it is the first step that costs, and each is but preparatory to a newer and greater and more profitable one.

Three or four millions more would have erected rolling-mills to convert all this iron into bars, and thus to produce a demand upon the farmer and the planter as great as that which has been produced by the fifty millions.

Ten millions would have built a hundred great cotton factories, furnishing a market for two hundred thousand bales of cotton, and five millions of dollars' worth of corn and clothing.

Instead of opening these mines and building these furnaces and rolling-mills and cotton-mills, the tariff of 1846 has closed large numbers of those which were already in existence, and driven the miners and the workmen in iron and cloth to seek the West, there to become producers of food.

The people who made the machinery and built the houses, would have been consumers of corn and cotton, and not producers of either. They would have needed houses at home, instead of houses in Texas or Iowa. The demand for houses would have made a market for timber. The demand for timber would have cleared the rich soils with profit to their owner, who would have felled his trees instead of paying men for killing them. He would have produced more food, and more people would have come to eat it, and they would have wanted more clothing, and more mills would have been needed, and more stone, and timber, and lime, and clay would have been required; and with each step he would have been improving the great machine, while concentration would have afforded him means of improving his mind and his tastes, and of educating his children.

Six millions would have built two hundred woollen factories, that would have used thirty millions of pounds of wool in a year; and distributed among farmers, workmen, and workwomen, twenty millions of dollars in a year, to be applied to the purchase of food, by which the farmer would have been enabled to improve his better lands—of wool, by means of which he would have been enabled to improve his breed, and increase his product—of timber, by aid of which he would have been enabled to clear his land—and of stone, by aid of which he would have been enabled to bring his quarries into use; while the constantly increasing circulation of man and of machinery, and of their products, would have offered large inducements to improve the roads by which he could transport to market the surplus, for which he would have obtained better prices; because population would have increased far more rapidly than at present, and men would have remained at home instead of seeking the wilds of the West; and the increased demand for labor throughout the country would have enabled all to consume more; and thus his *powers* when at market would have increased as his *necessity* for seeking that market decreased.

But is this all? It is not. The annual saving from this improvement of the machinery of exchange would have gone again upon the land, and more lumber would have been raised, and wages would have been greater, and the demand for houses and machinery would have made a market for the labor of thousands, all of whom would themselves have needed houses, and all would have consumed more food and clothing; and the quantity to be sent into the great market of the world would have diminished, and prices would have risen. The farmer and planter would have increased their crops, while the machinery of transportation would have improved and the loss in exchanging would have diminished and all would have grown rich, and all would have acquired more power over land, and over themselves; while their land would have improved hourly in value. Their *necessities* would have di-

minished, and their *power* would have increased, and as they made their own iron and cloth, and ate their own food, they would have been enabled to purchase more silks, and books, and newspapers, and pictures, and statues; and intellectual power would thus have grown with physical and moral power, and thus wdr ioulpmovement have kept pace with freedom.

Why has not all this been done? Why is it not now being done? Let us ask the farmer. He will tell us that cloth is sometimes high and sometimes low: that the woollen manufacturers have invariably been ruined by the perpetual fluctations of England. He will say that at this moment, under the tariff of 1846, coal and iron, and cottons and woollens are destroying all those engaged in their production. Further, he will say that if he and his neighbor farmers desired to associate for the purpose of building a mill, they would have to be bound, each for all; and that they cannot get a charter, as there is no general law for that purpose, and the power freely to associate has no existence.

Ask the planter. He will tell us that the cotton manufacturers have been ruined over and over again—that cotton goods are sometimes high and sometimes low—that last year they were high, and that now England is forcing them into every market of the world—that he has no charter, and that without this he and his fellow-planters cannot associate; whereas, if they had a general law for the purpose, every man in the neighborhood would subscribe a little, and that then they might make an effort at concentration.

Ask the farmer of Pennsylvania why he does not associate with his neighbors to erect a furnace, and his answer will be, that eight years since all the iron-masters were nearly ruined; that five years since iron was worth £10 or £12 per ton, but that now it is down to £5, and that those who then built furnaces and rolling-mills have since been ruined.

Here lies the secret of dispersion. Here is to be found the cause of the impossibility of concentration. The people of the United States have no power over their own actions. They waste annually more labor in hauling *their products to market*, and *their consumers from market*, to the West, there to be employed in raising more food and cotton, than would build places of exchange for all their labor and food and wool. They waste on the roads the manure yielded by the products of poor soils, and they leave on the rich ones the manure that has accumulated for ages, and that would render their poor ones rich; and while they shall continue so to do, they must scatter themselves over the far West—they must leave home, and friends and school-houses behind—they must continue to be hewers of wood and drawers of water on the poor soils, instead of becoming rich on the fertile ones—they must continue to obtain bushels where they might have tons—they must continue to do as do the people of India: cultivate poor soils, and find themselves bogged in the rich ones through which they have to drag their products to market.

The annual loss to the people of the Union, from the want of the power to concentrate themselves on the rich soils, is far more than the value of the whole exports of England *to all parts of the world*, and were she to give them the whole, the gift would be injurious. It would tend only to scatter the people more widely, for concentration would then be impossible, and *without that the earth cannot be made to yield;* and unless it be made to do so, the poor soils cannot be made rich. POPULATION MAKES THE FOOD COME FROM THE RICH SOILS, while depopulation forces men back to the poor ones.

The number of States employed in producing cotton is ten. The whole product is about two million three hundred thousand bales, and the average

is therefore about two hundred and thirty thousand bales per State. To prepare a State for producing that quantity, and the food that is to be consumed by the men who raise it, has cost hundreds of millions of dollars. To place in that State machinery requisite for the conversion of all its cotton into cloth, would cost twelve or fifteen millions of dollars, *or less than the amount annually wasted* of labor for want of employment at home—of labor and manure in transporting the product to market—of labor and manure in transporting men to new lands—of crop, from the want of hands to pick it—of freights, because of the increased demand for ships and wagons—and of prices, because of the surplus in the markets of the world: and *less than half the amount annually wasted*, because of the necessity for cultivating poor soils while rich ones lie idle.

The cost of transporting the hides and the food to the shoemaker, his awl and his lapstone, is great, and all the manure is lost, and lost for ever. The cost of bringing the awl and the lapstone to the hides and the food is small, and all the manure is saved; and the great machine is improved, because the manure is saved; and the shoemaker wants a house, and the house wants timber and stone, by the furnishing of which the land is cleared. A large portion of the people of the United States are busily employed in carrying the hides and the food to the awl and the lapstone, and in driving people who might use the awl to other places where they must raise more hides and food.

What is the remedy for this state of things? The answer is easy: England must be made to raise her own food, and she must be made to let other nations consume theirs. The resistance of the United States put an end to the navigation laws. Their resistance killed the right of search. Their resistance will kill the colonial system, and give freedom to India and Ireland, to *the people* of England, and to themselves.

To their resistance is due the fact that competition has already been in some degree established, and that the monopoly system of England is tending gradually to its fall. To make a short war, however, it should be a strong one. No set of men can now feel any confidence in erecting iron-works, cotton-mills, or woollen-mills, and until confidence shall be restored, the little capitalists cannot get to work, and the business must remain in the hands of great ones, who can run great risks; and while that shall be the case, but little will be done. Almost all that exists in the Union is the work of the millions of little men engaged in improving the great machine—the earth—and when they, the little farmers, and little mechanics, and little shop-keepers, shall feel themselves protected in their efforts to get to work, the production of iron, and of cotton and woollen cloth, will go ahead as rapidly as farming has done, and then concentration will take place, and the rich soils will come into cultivation, and every county in the Union will have its iron, or its cotton, or its woollens exchange, and then land will double in product and in value. There is not a single county that could not supply the stone, the timber, and the labor necessary for building a furnace or a mill, and the food or the cotton necessary for the purchase of machinery—thus making a place of home exchange. Once built, further capital would not be needed. The grower of corn, and hay, and oats, and wool, and the young men and young women who have labor to sell, perform their exchanges at the factory, which becomes a little bank, in which each man buys a share while accumulating means to build a house or buy a farm, selling it again when the house is built or the farm is bought. Throughout the Union, south of the Hudson, there is not a single county in which there is not more labor unemployed than would build

such a place of exchange; and not one in which, for want of such a place, there is not wasted ten times more labor power than would suffice to carry it on. Were each county to help itself, all would be helped.

Wealth is power. The people of the United States have the wealth. That wealth has given them power, dispersed as they have been, to do much. Concentration will give them greater wealth and greater power. Their twenty-three millions produce at this moment a greater quantity of commodities than the people of England, while they build twice as many houses—make twice as many roads—apply thrice the labor to the improvement of land—build four times as many school-houses and churches—and print ten times as many newspapers. The machinery of production is greater than that of England, and all they now require is better machinery of exchange. Let the farmers and planters have this, and population will increase with greater rapidity than ever, for young men will stay at home and marry, instead of going to the West; and tens of thousands of mechanics, and of coal and iron miners, will seek the United States; while laborers will come by hundreds of thousands, if not by millions, and every man will furnish a mouth to be fed, instead of, as now, furnishing hands to produce food. They will then be consumers of corn, and wool, and cotton, instead of producers—customers, instead of rivals. The Irishman, once landed here, will consume a dozen pounds of cotton where now he consumes not even one, and he will consume mutton and beef, instead of starving on a handful of potatoes. Corn and cotton will be produced at less cost of labor, and wages in corn and cotton will be higher, while cloth and iron will be cheaper, and the farmer will cease to have to pray for bad crops in Europe; while the planter will find in the increased demand for his product, consequent upon the higher wages of England and of Europe, a certainty of a good market for all he has to spare. Coffee, and tea, and sugar will then be paid for in cotton cloths, and the men who make the cloth will be customers to himself and to his brother agriculturists of the north, who will use more cotton than at present; while Brazil and Cuba will want more cloths, because they will have a better market for their sugar. Every diminution in the machinery of exchange tends to give more time for improving the great machine of production, whether for cotton or sugar, wheat, rye, oats, or hemp—to increase the quantity produced—to increase the wages of the laborer and the profits of the capitalist, whether landed or moneyed—and to increase the comfort and happiness of all.

Let but the people of the United States set the example of a determined resistance to the system, and it will be followed by all Europe. British artisans will then seek America and Germany, and Britain will raise her own food. Her fleets and armies will disappear, and her colonies will become independent.

The people of the United States owe this to themselves, and to the world. They enjoy a higher degree of happiness than has fallen to the lot of any other nation, and they should desire to aid their fellow-men in England, in Ireland, in Germany, and in India, and by helping themselves they will help them. As colonies, India and Ireland will remain poor. As independent nations, they will become rich, for they too will insist on the right of placing the consumer by the side of the producer.

Westward the star of empire wends its way. From the west to the east civilization has gone, and so it has yet to go—from the base of the Alleghanies to the foot of the Himalaya. The measure is one of peaceful and quiet, but determined, and it should be of united, action. It is one that interests

Every planter that wishes to cultivate rich lands instead of poor ones:

Every farmer that would raise tons instead of bushels:

Every father that would wish to see his sons and his sons' sons settle round him:

Every mother that wishes to see her daughters married:

Every son that would have a wife and a home of his own:

Every daughter that would have a husband:

Every journeyman that would be an employer:

Every laborer that would have a farm and a house, or shop, of his own:

Every property-holder that desires higher rents:

Every man that hates crime and loves virtue:

Every man that loves literature and art:

Every man that loves freedom:

Every man that loves *the people* of England: or of France:

Every man that loves Ireland:

Every man that feels for India:

Every man that loves his old fatherland, Germany:

Every man that loves free trade:

Every man that loves peace:

Every man that loves his fellow-man:

Every man that loves his Creator:

Every man that desires that the great law of Christ, "Do unto others as ye would that others should do unto you," should become universally operative.

It is the great work reserved for the people of these United States. It is one that they have the power to accomplish, and it should be entered upon with the same feeling that animated the Puritans of old; the same that gave confidence to the men who, seventy years since, signed the Declaration of Independence. It would be a peaceful war for the emancipation of themselves and of the world.

For two centuries past, the world has been perpetually disturbed by the wars of England and France, for ships, colonies, and commerce. Had France had no colonies, there would, probably, have been no wars of the French Revolution after the failure of the invasion of 1792. But for them, France would have been permitted quietly to settle down, in which case Italy and Spain, Holland, Germany, and Russia, would have escaped the war of twenty years, and France might now be rich, powerful, and free. The system of both nations is one of perpetual interference. At one time, Poland is to be excited; at another, she is to be abandoned. At one time, Greece is to be aided; at another, Syria is to be delivered over to the tender mercies of the Egyptian Pasha; at a third, China is to be made to buy opium, and to open her ports to the cloths of the men who have ruined the poor manufacturers of India. At one moment, the affairs of Spain require the interposition of England; at the next, we see her fleets in Portugal, dictating terms to people driven by oppression to revolt. At another, France governs Spain, and the country is made a scene of murderous war, while the court is one of endless intrigue, having for its object the promotion of the interests—not of France, but—of the family of Louis Philippe or Louis Napoleon: all anxious, as French princes have at all times been, for *appanages* at home, and thrones abroad. For centuries has the European world been agitated by the princes of the houses of Valois and Bourbon, and those of the house of Orleans and of the family of Bonaparte are well disposed to follow their example. For years past has almost all commerce with the La Plata been interdicted, because England and France chose to interfere in affairs that were not their

own. They failed, and the country was worse by years of wars and poverty. But a few years since, the affairs of Texas claimed their attention. Now Central America has become the focus of the intrigues of England. But a short time since, the people of the United States were to be *compelled* to join in a crusade against the African slave-trade, which would long since have ceased to exist had England and France permitted the world to remain at peace. At every difference of opinion as to rights, we are menaced with the destruction of our towns and cities, and the seizure of our ships. At every quarrel, whether to maintain the trade in opium, or to put down that in slaves, our trade is interrupted. The two nations are everywhere seen meddling with everybody's business, and neglecting their own.

They are the great bullies of the world. Italy would now be strong to help herself, but for the wars of France and England. So would Spain and Germany. Wars made for private ends are afterwards carried on for "the public good," and in defense of "the liberties of Europe," which will take care of themselves whenever the armies and fleets of England and France shall disappear, but not until then. Both countries should be placed under bonds to keep the peace; and the peace-loving portions of the earth can take those bonds when they will. Both should be made to turn their attention homeward—to raise their own food—to feed their starving artisans—to improve their own morals—to free their own people from the thousand restrictions under which they labor—and thus would they set to the world an example far more worthy to be followed than when they are seen preaching liberty and practising oppression; paying for slaves in the West Indies, and making slaves in the East by means of taxes on salt for the payment of dividends on India stock. Nations that pursue the natural system of concentration will find that the first of all rules is the simple one: "Let every man mind his own business." The people of the United States possess the power of compelling both nations to follow this rule; for if they determine on the course that is essential to their prosperity, it will be followed throughout Europe; and then fleets and armies must be abandoned, and colonies must be left to exercise the right of self-government.

THE REAL GRANDEUR OF NATIONS CONSISTS IN THE PERFECTION OF THE SELF-DEFENSIVE POWER, and that is now possessed by the United States in a degree greater than any other nation of the world. They have laid the foundation of a pyramid whose base is a million of square miles, occupied by twenty-three millions of people, and filled with little communities, each with its little school-house, its church, and its newspaper. Each of those little communities occupies space sufficient for a large one, with its academy, or its colleges, its numerous churches, its newspapers, its bookstores, and its libraries, all aiding to give to the structure a height proportioned to its base; and that height may be obtained whenever the planters and farmers of the Union shall determine to exercise the right peaceably to defend themselves. Until they shall do so, concentration cannot take place. Until they shall do so, their people must continue to waste their labor upon poor soils, yielding bushels, while neglecting rich ones that would yield tons. Whenever they shall do so, they will at once take the place to which they are entitled by two centuries of peaceful action, in which it is difficult to discover a single important error until the occasion of the Mexican war; and we cannot but hope that they will hereafter exhibit to the world a specimen of real greatness, in protecting instead of assaulting their poorer neighbors incapable of self-defence. They are strong, and they can afford to be generous. With England and with France lies the

great contest, and it is for the exercise of power over their own actions; for the exercise of the right to stay at home and become rich by the cultivation of rich soils, in preference to flying from home to remain poor while cultivating poor ones: and every dollar spent in support of fleets and armies tends to lessen the power vigorously to maintain that one which is to result in the emancipation of the world from the tyranny of foreign fleets and armies, and the establishment of perfect peace. The truest grandeur consists in the most perfect power over ourselves, our thoughts, and actions, and in conceding to all men the exercise of the same powers that we desire for ourselves. The people of the United States do not exercise that power; but they may do so, and we trust they will. Their position is one of surpassing strength. They are twenty-three millions, among whom there is universal activity and intelligence. Of these seven hundred and fifty thousand are the product of the present year, and soon the addition of a year will reach a million. They have more school-houses and more scholars in them, more churches and more hearers in them, and thus print more books, than any other nation of the world. They have more and better printing-presses, and they consume more paper; and their authors are better paid.* They have a mercantile marine that can perform more service in a given time than any other. Their machinery of manufacture already, in many departments, takes precedence of that of England. They have railroads, canals, and magnetic telegraphs, over a surface of five hundred millions of acres. They have thirty millions of sheep, five millions of horses and mules, fifteen millions of cattle, and thirty millions of hogs.† They raise a thousand millions of bushels of food for man, and more than a thousand millions of pounds of cotton; and this vast product can be doubled by the application of the same quantity of labor, whenever they shall determine that *they will* make their own cloth and their own iron, and, by thus placing the consumer by the side of the producer, enable the latter to cultivate rich soils instead of poor ones. So soon as they shall have thus determined, thousands of tons of the surplus machinery of England, and tens of thousands of her artisans, will be seen leaving her shores to place themselves where food and cotton together grow, and where liberal and constant wages will be the reward of moderate but steady labor; and the Union will then, but not till then, occupy that position before the world to which its generally peaceful policy so fully entitles it. It needs but the effort to place it speedily in a position to dictate the law of the ocean—to say to the other nations of Europe that in future the trade of the world shall be freed from the restrictions imposed by blockades, orders in council, rules of '56, colonial systems, and all the other contrivances by which the prosperity of ourselves and of the world has been thus far hindered. Such was the tendency of the democratic tariff of 1842. Directly the reverse is that of the tariff of 1846. The one tended to give us power over the movements of the world by increasing our power over ourselves; the other tends to diminish our power to control the movements of the world by lessening our power over ourselves. The tendency of the one was to peaceful and quiet grandeur; that of the other to warlike and unquiet littleness. It is for the people to choose between them.

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* We except from this the authors of such trash as "*Le Juif Errant*," and of histories whose object is to teach that "glory" is the great object of life, and that it is to be sought at any sacrifice of honor or honesty. Such writers are better paid in France.

† Great Britain and Ireland, with a population of twenty-eight millions, have forty millions of sheep, two millions of horses, and five millions of cattle. France, with a population of thirty-five millions, has thirty millions of sheep, three millions of horses, seven millions of cattle, and five millions of hogs.

SALE AND SACRIFICE OF MANUFACTURING PROPERTY.

THE *New-Bedford Mercury* says that the cotton mills, machinery, and dwelling-houses of the Farmers' Manufacturing, Company, in Attleboro', were disposed of at auction on the 4th inst., by assignee's sale, for $22,075. The property originally cost from $50,000 to $60,000.

One by one the farmer's best customers are being sacrificed under the operation of the tariff of 1846; and as a necessary consequence of this, we see the gradual conversion of our population, from being consumers of food and *customers of the farmer*, into producers of food and *rivals of the farmer*.

The diminished demand for the smaller products of the farm, or for those more bulky products that will not bear carriage, resulting from the closing of mills, and furnaces, and mines, causes the emigration of thousands and tens of thousands of men who would have given value to the land; and hence it is that we see the new States being filled up with the "steady, well-educated farmers" of the older States referred to in the following article:—

IMMIGRATION.—The Iowa papers record the arrival of large numbers of immigrants in that flourishing State. It is said that the majority of them are not foreigners, but of the steady, well-educated, and industrious farmers of New-York, Ohio, Pennsylvania, and other northern States. For the most part, they are men of substance, as well as enterprise.

We are now rapidly converting our population into producers of food, and sacrificing the consumers of food; and this we are doing because it is held that that is the mode of procedure by which the farmer will be enabled to obtain higher prices for his products. The next operation of our *free trade* friends is to be that of sacrificing the farmer by aid of the mechanics and operatives of the Union, who are assured that "*the practical operation of the duties on agricultural products is to raise the price of the necessaries of life to the non-producing consumers in towns on the seaboard, to the exclusive advantage of the Western farmer.*" We invite our agricultural friends to peruse the following sketch of the course of proceeding by aid of which the advocates of the tariff of 1846 expect to be enabled to abolish the protection now afforded to them against the cheap land and cheap labor of Canada, and then to determine if their own interests do not imperiously require that they should combine their efforts with those of the other advocates of protection to American labor:—

The Legislature [of Canada] has now been in session nearly three weeks; but, with the exception of some skirmishing, in which McKenzie took an active part, the proceedings have been chiefly of a routine description. There is a series of resolutions before the House, which will probably come up for discussion in a day or two; the object of which is to forward an address to her Majesty, praying that she will recommend to the Imperial Parliament to enact that a like duty may be imposed on grain, breadstuffs, vegetables, fruits, seeds, animals, hides, wool, cheese, tallow, horns, salted and fresh meats, ores, plaster of Paris, ashes, timber, staves, wood and lumber of all kinds, as are imposed by foreign nations on the importation of similar productions of Great Britain and her dependencies; and praying further, in another series, which has been submitted for consideration, that her Majesty will not withhold her royal assent from any act that may be passed by the Legislature of this Province, for imposing differential duties on imports, by which importers will be encouraged to bring their goods into Canada by sea, via the St. Lawrence, instead of through the United States.

It will hardly be possible at present to form any idea so as to judge with certainty of the action of the House on this subject; but from what fell from Mr. Hincks, the leader of the Government in the House, the other day, it is not improbable both propositions

will be entertained; the effect of which would probably be the successful result of the negotiations that are pending between the United States and Great Britain; as the duties at present imposed in the former country on the productions of Canada, (which are not exacted, however, when they are exported,) *the practical operation of which is to raise the price of the necessaries of life to the non-producing consumers in towns and on the seaboard, to the exclusive advantage of the Western farmer.*

It is probable, I think, that the British Government will agree to the imposition of differential duties; and as it is evidently to the interest of the Province that intercourse with England should be via Quebec, it may receive the royal assent. To encourage shipments and importations by this route, an address will be moved to the Queen on the subject of a line of ocean steamers between Liverpool and Quebec.

I hope, however, that the removal of restrictions which are of no general benefit to the United States, will prevent the adoption of either of the ulterior measures that have been proposed, the withdrawal of which, it strikes me, would be of more advantage to Canada than to the United States; and I feel satisfied that if the attention of Congress were once directed considerately to the subject, the heavy duties on articles imported from Canada would be no longer imposed.—*Exchange paper.*

CONSISTENCY OF FREE-TRADERS.

We take the following from one of the free-trade papers of the day, and recommend it to the careful consideration of our readers. We are here told that "the farmers and mechanics should be direct customers to each other," and that by so doing, they would relieve themselves from paying "the profits of a host of intermediaries,"—and that the farmer and the mechanic would thereby be enabled to grow rich; and yet, the same journal is a warm advocate of the tariff of 1846, which is gradually closing the mills and furnaces at which the farmers and mechanics were enabled, under the the tariff of 1842, to effect their exchanges, and compelling them to make their exchanges at a distance of thousands of miles. The farmer of Ohio sees the neighboring furnace closed, and he mortgages his farm for the purchase of the iron of Britain, *whose whole purchases of our food will scarcely pay the interest on the debt we are now so rapidly accumulating;* and this, according to one of the columns of our contemporary, is the way in which he is to be enriched, while in accordance with another column, he is to be enriched by bringing the producer and the consumer into closer connection with each other! Such is the consistency of those who teach that freedom of trade is to be sought by aid of other means than full and complete protection!

Protective Movement.—Some time ago, we mentioned the "Protective Unions," or associations among farmers and mechanics for their mutual benefit, which had already become numerous in several of the New-England States. They originated, if we mistake not, in Boston, and thence spread rapidly through the rest of Massachusetts, and thence into other States. *Their object is to make the farmers and mechanics direct customers of each other, without compelling them to pay from the produce of their labor the profits of a host of intermediaries;* and they accomplish this object partly by barter, and partly by purchases at wholesale instead of retail prices. A plan is now under consideration for introducing this system, upon an extensive scale, at Weedsport, Cayuga county, in Western New-York, and a list of subscribers to it already includes the most intelligent and wealthy farmers of that region. Stock to the amount of $10,000 is already taken, on which 10 per cent. has been paid. If this project succeed, hundreds of similar character will be established in the State, who will eventually unite in establishing in the city of New-York an importing and jobbing house, and a depot for agricultural produce and manufactured articles. These associations in New-England already have similar depots in Boston; and if they succeed in New-York also, they will soon be established in Pennsylvania, and have their depots in Philadelphia.

Some will object to these associations as "socialism," and say that "socialism" means

"infidelity" and all kinds of mischief. But let us consider the subject rationally, without being blinded by frivolous or vulgar objections. So far as "socialism" means the union and co-operation of individuals and families, for the purpose of reaping the full benefit of their labor—and we have never understood it in any other sense—it means something worthy of universal support and encouragement. Common sense and common justice will say that the farmer should receive most, if not the whole price paid by the consumer for a bushel of wheat, and the shoemaker most or all of what is paid by the wearer for a pair of shoes. But under the present constitution of society, or rather the present constitution of trade, the farmer and shoemaker receive much the smaller portion. The remainder goes into the pockets of various *middlemen* or intermediaries, in the shape of wholesale and retail merchants and tradesmen and carriers. Beginning with a bushel of wheat, we find that the farmer sells it to the miller, who grinds and sells it to the wholesale dealer in the city, who sells it to the country trader, who carries it back to the region where it grew, and sells it to the shoemaker. The latter may pay seven dollars for a barrel of flour containing five bushels of wheat, while the farmer may have sold this wheat for fifty cents to the bushel. The difference is four dollars and a half, which is divided among all these intermediaries. If their number could be diminished, the producer would get more, and the consumer pay less. So the shoemaker sells his work to the wholesale dealer, who sells to the retailer, who sells to the wearer, perhaps the maker and wearer dwelling in the same town, while the wholesale dealer dwells one or two or three hundred miles distant.

Can the number of these intermediaries be diminished without interfering with the convenience of producers and consumers? Their total extinction would reduce the world to barbarism. But their needless multiplication "robs the laborer of his hire," and promotes that concentration of property, that aggrandizement of the few and impoverishment of the many, which has ever been the tendency of civilization, ancient or modern, and which is the source, in conjunction with bad government, of the manifold evils under which Europe now labors. The "middlemen," the numerous intermediaries between landlord and tenant, are the standing theme of complaint among English statesmen and political economists, to which they refer most or all of the misery that paralyzes Ireland. The same system prevails in commerce, and produces the same results, the robbery of the producer, the enhancement of price to the consumer, the concentration of property, the multiplication of paupers. Farmers and mechanics, the producers, are not so rich as merchants and traders, the intermediaries. The two former, while producing all luxuries, are comparatively restricted to necessaries. The two latter, who produce nothing, are the greatest consumers of luxuries. The distribution is unjust, not because the latter are unnecessary, but because they are too numerous. These associations tend to correct, or at least to diminish this evil.—*Phil. Ledger.*

INSTANCES OF CATTLE FEEDING.—1. Lot 1st, 13 three-year-old heifers, mixed breed. Lot 2d, 7 three-year-old bullocks, mixed breed. Lot 3d, 9 three-year-old heifers, Hereford breed.

2. Lot 1st, soiled in yards during summer; put up to fatten 6th October. Lot 2d, ditto, ditto. Lot 3d, Put into open yards as soon as bought.

3. Lot 1st, tied up in stalls 10½ feet long by 4½ feet wide. Lot 2d, ditto. Lot 3d, in open yard, with shed to lie under.

4. Lot 1st, each beast consumes daily 70 lbs. raw Swedes, 2½ lbs. linseed-meal soaked in cold water, 2 lbs. barley-meal, and 8 lbs. straw chaff. Lot 2d, each beast consumes daily 90 lbs. raw Swedes, 2½ lbs. linseed-meal, soaked as above, 2 lbs. barley-meal, and eight lbs. straw chaff. Lot 3, put in the yard to freshen up for stalls, receiving a small quantity of turnips, with as much straw as they can consume, but no account taken of the quantity.

5. Little wheaten straw; no account taken of the quantity.

6. Lot 1st, estimated increase in weight by Christmas, 10 imperial stones; the value depends on the market price when sold. Lot 2d, increase in size more than the first, but not so forward. Lot 3d, going on very well.

7. As clean as hunters; very comfortable.

N. B. There are no cattle bred on this farm; they are all bought regardless of breed, endeavoring to buy what will pay best.—*English paper.*

IRRIGATION.

Translated principally from the "Journal d'Agriculture pratique."

BY F. G. SKINNER.

[*Continued.*]

Means of Improving the Quality of Water.—Any water naturally unfitted for irrigation may be so treated as to be rendered useful for that purpose. Water may be unsuited to the growth of plants from three causes. It may be too cold, or, from a prolonged sojourn in a bed wanting inclination, it may be too warm; again, it may become stagnant and charged with principles inimical to vegetable life. As has already been stated, the collection of the water in reservoir until the temperature rises, is the remedy for the first evil; and motion communicated in various ways will correct the two last. The fertilizing power of a stream may be greatly augmented by placing in its bed a coffer, constructed of slats, which is filled with such manures and offal as can thus be disposed of. Patzig, who recommends this course, says a mixture of sheep's-dung and lime, thus used, produces the most astonishing results; moreover, says the same author, "Instead of burying the animals that die upon the farm, they should be thrown into this coffer, and the meadows will be thereby greatly benefited. In a short time a bluish-colored oil will be seen upon the surface of the water, which, deposited upon the sod, communicates to vegetation the most extraordinary activity. The solvent power of running water is remarkable, and much greater than is usually supposed, for at the end of six months not a trace remains of the carrion thrown into it; all, even the bones, are dissolved and carried off."

Action of Water upon Different Varieties of Soil.—Wherever water exists, a meadow may be created and grass grown, and though this is the case on all soils, the action of water is nevertheless subject to variations depending upon the surface upon which it is applied. Water nourishes and stimulates vegetation; it affords a protection from sudden atmospheric changes; and, finally, it delivers the meadow from many enemies, as well animal as vegetable.

Water Nourishes Plants.—Considered as a manure, (as has already been shown,) water contains mineral, vegetable, or animal particles, and occasionally all three. Water charged with any of these enriches by its deposits the surface over which it flows, but motion is necessary. The proof of this is, that the fertilizing action is much more apparent upon meadows of rapid inclination than upon those that are not. In this last case the water flows slowly, depositing only the grosser matter which it contains; while the finer particles, those the most favorable to vegetation, are lost, because there is not sufficient friction to separate them. Where the surface is too level, the water dwells upon it; a portion is absorbed, while the remainder is evaporated, not only without any beneficial effects, but acids are formed which destroy the valuable, and favor the growth of useless plants: this evil may often be remedied by increasing the quantity of water, as then from its own weight it acquires a swifter motion. If the grass should grow thicker and better along the edges of the trenches, the inference is, that the irrigation is imperfect, and the surface should receive more slope, that the action of the water may be extended to points more remote. Vegetation, however, to a certain extent, is always more active near the trenches; the water as it advances becomes despoiled of

its enriching ingredients, and the ground should accordingly be so disposed as not to irrigate too wide a space with the same water. When the quantity of fluid to be disposed of is small, as is generally the case when that from springs is used, the surface can scarcely be too much inclined, for then the effects of the water seem to multiply and extend much farther. If, where the quantity of water at command is small, the slope cannot well be too great, it is not the case where the supply is abundant; and due care should be observed in proportioning the quantity of water to the degree of slope, for much water flowing rapidly will wash away the vegetable earth and lay bare the roots of the grass.

Water a Stimulant to Vegetation.—It has been observed that the pores on the under-side of the leaves of such plants as grow upon irrigated land are larger than those of the same plants growing elsewhere. The inference is, that the first possess greater powers of absorption, and that irrigation increases their vitality, and renders them capable of taking in a greater quantity of the atmospheric gases.

Water protects and preserves Plants; for as long as water runs upon a meadow, the temperature remains uniform, and the ill effects of sudden atmospheric changes are prevented. Even where vegetation is overtaken by frost, it may be protected from injury by letting on the water before a thaw. Finally, water is an efficient agent in delivering meadows from destructive vermin and insects, such as mice, moles, grasshoppers, &c. In the same way, properly applied, it destroys the sedge and heath of dry, and the sour vegetation of cold, wet land.

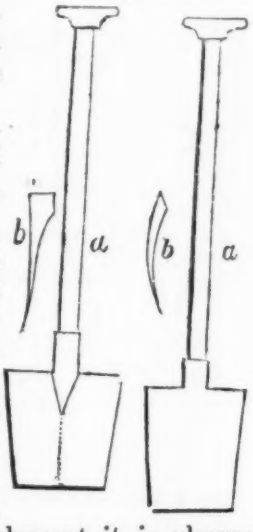
These different effects of water are modified by the nature of the soil it flows over. Thus there is no soil better adapted to irrigation than that which is sandy; though naturally dry and sterile, it can with sufficient moisture be converted into excellent meadow, and this is probably the most profitable disposition to be made of it. Precaution, however, is necessary in watering sandy land, for if it be loose and shifting, it must be allowed, after being properly graded and seeded to grass, to stand a year before irrigation commences; otherwise the water will filter through the surface and re-appear in the lower trenches, oxidized and spoiled. It is bad economy to be deterred by expense from covering a sandy surface with grass. The quality of the grass is a secondary consideration; the main object is to *bind the sand.* Subsequent irrigation will soon change the nature of the growth, whatever it may be, and the finest herbage will supply its place. Should the sand be mixed with clay, even in small proportion, barely enough to give it some consistency, it may at once, without previous preparation, (other than grading,) be submitted to irrigation. Before a sandy soil becomes consolidated and well clothed with grass, it requires a great deal of water, and that which is turbid and muddy, as it usually is after rain, is best suited to it. An equal mixture of sand and clay makes the best meadow, yielding in quantity and quality the finest crops; it is improved by any water not naturally bad, and requires much less moisture than sandy land.

A stiff clay is not well adapted to "water meadows;" roots penetrate it with difficulty, and of all soils it is the most difficult to irrigate; very little water should be let on at a time, but the irrigation must be prolonged. A strong flow of water covers the surface with a cement which adds to the natural tenacity of the soil, and which becomes indurated, almost to the hardness of brick, on exposure to the sun. The best corrective in this case, where the means are at hand, is to add to the clay an earth of less consistency; the work will be facilitated and the vegetable growth increased. If, in grading

land for irrigation, it becomes necessary to remove the sod, (to be replaced when the grading is done,) there must be no precipitation in letting on the water; the sod must first be allowed to take root; else the water, running between it and the land, will prevent the roots from striking in, and the sod will perish.

Calcareous soils, being naturally warm and rarely retentive of moisture, are liable to suffer from drought, and for this reason they are peculiarly suited to, and are much improved by irrigation. Though almost any water is beneficial to them, that from springs is to be preferred, and they not only produce largely, but the hay is of the very best quality.

Fig. 2.



Preparation of the Soil.—Implements. In preparing land for irrigation, it is of consequence, as in every other agricultural process, that the implements and tools made use of should be the best of their kind. In agriculture, things seemingly of the smallest importance, though they contribute materially to success, are usually the last to occupy the attention of the inexperienced; and any imperfection in its various processes may generally be traced to a deficiency in, or neglect of the tools or implements employed; and for this reason, what otherwise might appear rather too minute a description of the several instruments and the manner of using them, in preparing land for irrigation, is here given. *The spade,* (fig. 2, *a.*) Notwithstanding the simplicity of this implement, it is always important, and indeed indispensable, and should occupy the first place; *b* represents the spade in profile. The curve is essential. This implement is not destined to turn up the earth, but to pare off the sod, to level the bottom of trenches, to cut by a line, &c. Except the handle (four feet long,) the whole is of iron, and the sides as well as the lower edge are kept tolerably sharp. The more spongy and mossy the ground is, the greater the necessity to keep the spade sharp, and as the implement is usually pushed forward by the pressure of the hands and chest, it requires a longer handle than those in ordinary use. Schwerz, from whom this description is borrowed, thinks it would be well (where the works are extensive) to have spades of different widths, to be used as the dimensions of the ditches and trenches may require. Where a single spade is used, it should not be wider than eight inches. Schwerz recommends still another, (figs. 3 and 4,) which he considers indispensable for lifting the sod, flattening the bottom of ditches, &c. The irrigators in the Seigen country do not attach as much importance to the spade as does Schwerz, and in its stead they use the shovel, (fig. 5.)

Fig. 3.

The round spade, (fig. 6,) though not mentioned by Schwerz, or used by the farmers of Seigen, will be found exceedingly useful. It is made of a single piece of wood, shod with a crescent (x, y) of steel, and is principally used for cutting the sod in lines by a cord. It may be as well to observe that in using it, it should not be withdrawn from the earth at every cut; on the contrary, it should be retained in the ground, pressed to the cord, and advanced by a circular motion one third of its length at each cut.

The crescent, (fig. 7.)—The round spade is best for the deeper ditches that carry off the water, but for the smaller irrigating trenches the crescent is pre-

ferred. The drawing is from the implement in use in Seigen. At the back of the blade a hoe is usually attached; this, though not essential, gives weight to the tool and effect to its blows. This hoe (fig. 8) may be used separate from the crescent. The crescent serves to cut the edges of the trenches, and

Fig. 4. *Fig.* 6. *Fig.* 7. *Fig.* 8.

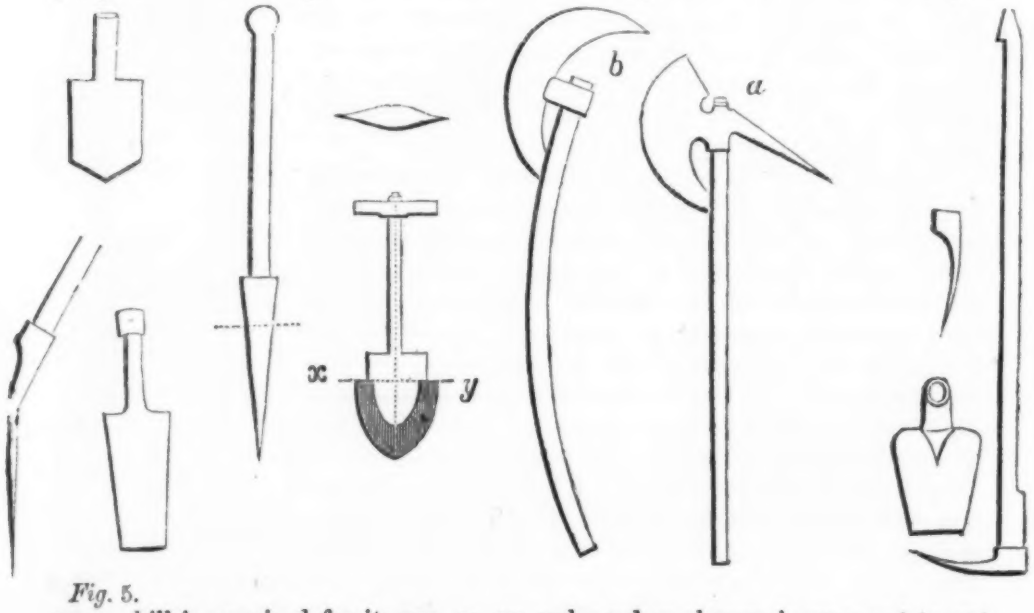


Fig. 5.

some skill is required for its use, as an awkward workman is very apt to cut the cord, which should always be used when straight lines are to be traced. When a trench is to be dug, the edges are cut with the crescent, and the sod between is taken out with the hoe. This operation is much facilitated when transverse cuts of the sod are made at short intervals. Fig. 7, *a*, *b*, are crescents with and without the grubbing hoe.

Fig. 9.

Fig. 9 is a flattening-board made of half-inch oak plank, as heavy as can be conveniently lifted, with a slightly curved handle. It is used for "patting" down the sod and loose soil. Figs. 10 and 11 are mauls to be used where the action of the levelling-board is not sufficiently powerful. For moving sods and soil to short distances the ordinary wheelbarrow should be used, and to avoid making ruts the tire should be unusually broad. The road-scraper is a val-

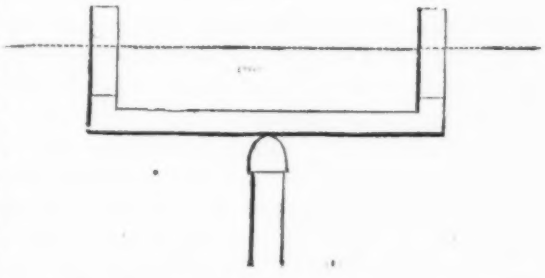
Fig. 10. *Fig.* 11.

uable implement, but it should not be used to carry dirt more than 35 yards.

Levelling, or Grading.—Before cutting ditches or trenches, the surface should be levelled, in order to trace out the plan of the works to be executed. For this several instruments are required. First, the water-level, made of quarter-inch tin tube, a yard and a quarter long; the extremities of this tube are turned up at right angles, and are surmounted by glass tubes of the same

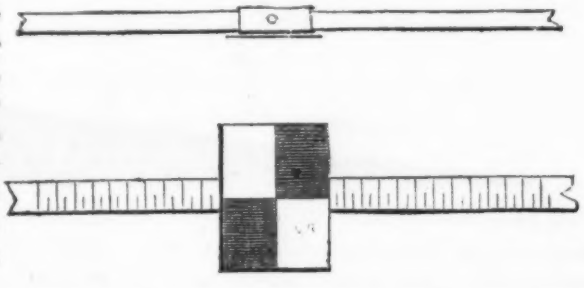
diameter a few inches long. (See fig. 12.) This tube is supported by a base that may be lengthened or shortened at will, like a common spy-glass, and a sufficient quantity of any colored fluid is put in it to rise half way in the glass tubes. When the surfaces of the fluid are exactly at the same height, a line drawn through them is horizontal. There are other instruments for levelling, but the above described is the cheapest, and will answer all ordinary purposes.

Fig. 12.



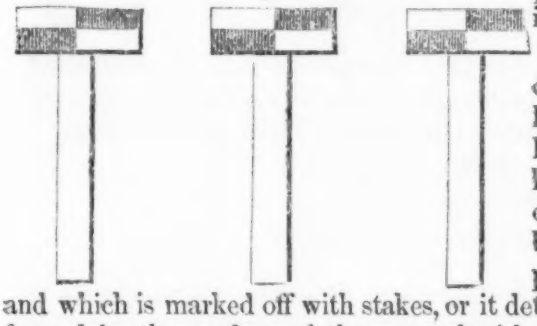
The levelling staff (fig. 13) is an indispensable adjunct to the water-level. This staff is three or four yards long, planed perfectly smooth down to two inches square, and marked off into feet and inches, or, what is better, tenths of a foot. Sliding upon the staff, and provided with a clamp or thumb-screw to fix it, is a board five inches square, divided as in the figure. The central cross formed by the lines is the point sighted at in taking levels.

Fig. 13.



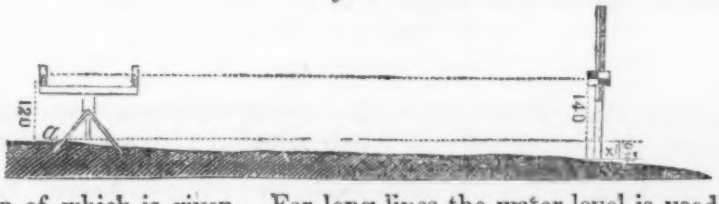
For short distances a much more simple instrument is used, the ordinary mason's level. The sighting boards (fig. 14,) three in number, are pickets four feet and a half high, with boards at the top, as in the engraving. Two extreme points being given, these boards serve to ascertain one or more intermediate points on the same line, whether it be horizontal or inclined.

Fig. 14.



Besides the instruments above described, a surveyor's chain, a large square, stakes of different lengths, a maul, and gardener's line, should be provided. By levelling is understood the operation by means of which from a given point a horizontal line is drawn, and which is marked off with stakes, or it determines the degree of inclination formed by the surface of the ground with the horizontal line, or, finally, it determines upon the ground the points through which a line will pass, the

Fig. 15.



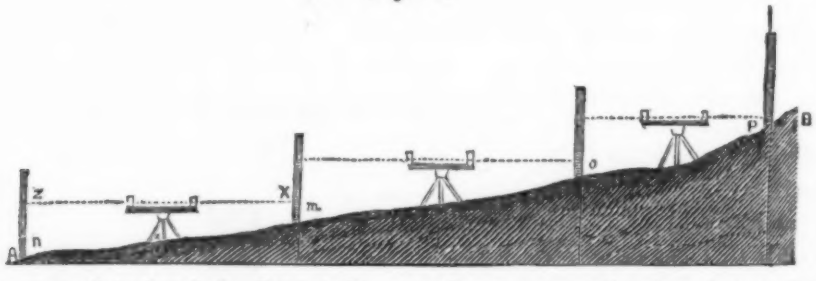
inclination of which is given. For long lines the water-level is used, but for short distances the mason's level is more convenient.

If it is desired to draw a horizontal line from a given point *a* (fig. 15) to

another point *x*, the level is placed at *a*, so as to sight conveniently at *x*. An assistant, standing at the point *x*, in obedience to signs from the operator, raises or depresses the board upon the levelling staff, until it is exactly at the height indicated by the water in the glass tubes. The height from the soil to the level of the water in the instrument is then measured and compared with that from the ground to the cross on the marking-board, and the difference indicates the depression of *x* below *a*.

If to preserve the inclination it becomes necessary to follow a very tortuous line, it may be avoided by sinking the ditch at certain points, and raising it by means of embankments at others. If the inclination between the points *a* and *x* is too great to be measured by the height of the staff, the distance must be divided into shorter lengths that can be measured. Thus (fig. 16)

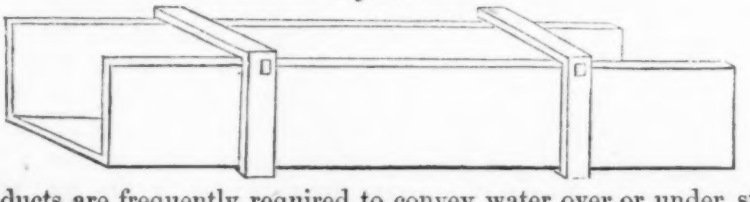
Fig. 16.



it is proposed to level the line A B, or rather to ascertain the elevation of P above *n*, but the point *n* is so low as to render it impossible with the level to sight to P. The level is then moved to the point *a*, whence it is easy to sight to *n;* the point where the line of sight strikes the staff at *n* is marked. The level remaining in the same place, sight is then taken at *m* and the point of intersection also marked; a horizontal line *z x* is thus obtained, and the difference of the two heights is the exact indication of the height of *m* above *n*, and so in succession with the other lines. The heights of *m* above *n*, of *o* above *m*, and of P above *o*, are added together, and their sum is the height of B above A.

Dams.—It is not necessary here to give directions for the construction of dams; but it may be as well to observe, that whenever they can be dispensed with by prolonging the irrigating ditch a few yards, it had better be done.

Fig. 17.



Aqueducts are frequently required to convey water over or under streams. They should be constructed as in fig. 17, of two-inch oak plank.

[To be concluded in next number.]

EMIGRATION TO TEXAS.—On the 3d inst., the Universal Emigration and Colonization Company dispatched their first ship, the John Garrow, of 1,200 tons, for Galveston. The emigrants comprised 150 farmers, with more or less capital. An influential director of the company preceded them, to make preparation for their reception. The celebrated Indian traveller, Mr. George Catlin, sailed in the ship to enter upon his duties as superintendent. The second ship is to sail in October, and is already half full of her complement of passengers.

ENTOMOLOGY.

NO. II.

BY S. S. HALDEMAN.

CLYTUS ROBINIÆ.—In Pennsylvania, in the month of June, this handsome insect may be met with upon locust trees, (ROBINIA PSEUDACACIA,) in the branches of which they lived as a larva. Its length (fig. 1) varies from half an inch to nearly nine tenths of an inch. The color is black, with transverse yellow bands, those upon the elytra being somewhat irregular. The under parts are varied with yellow, the legs are reddish, and the antennæ reddish brown.

Fig. 1.

The female deposits her eggs in the irregularities of the bark, and the young when hatched penetrates into the interior to feed upon the wood. The smaller branches are generally attacked, and the presence of the larva may be known by the wood-dust about the aperture where it entered, the cuttings being for some time ejected here. But the most prominent is the swelling of the branch at the point of attack, which becomes weakened, and is often broken off by storms, or dies, so that new shoots must be thrown out below. From these causes the tree becomes disfigured and materially injured. The annexed figure (2) represents a fragment of a locust branch attacked by this insect.

The same insect attacks hickory, and as the larva continues its depredations after the wood has been cut, it frequently does much damage; and we have known a large lot of hoop-poles to be destroyed by them. The figure (3) represents a piece of one of these poles split to exhibit the burrows of the larvæ, and their place of exit through the bark. A plug of woody fibres is observable in one of the burrows, similar to those made by the ELAPHIDION.

Fig. 2.

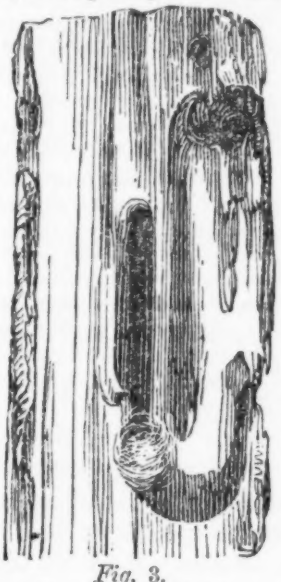


Fig. 3.

Dr. T. W. Harris, in his "Insects injurious to Vegetation," states, on the authority of Gen. Dearborn, that the grubs of this species are full-grown by the 20th of July, and the perfect insects leave the tree early in September, in Massachusetts. From this it is evident, that as they appear at different times in various parts of the country, the proper season for cutting wood infested by them must vary. Hoop-poles should be cut before the eggs are laid, or they should be soaked some time in water. This would kill the larvæ, not only of Clytus, but of another and much smaller insect, which burrows beneath, and loosens the bark, and penetrates and destroys the wood of hoops, long after the barrel has been finished and applied to its proper use.

Fig. 4.

Dr. Harris recommends whitewashing the trunks of trees to prevent the insects from affixing their eggs; he also recommends catching the adults and drowning them in bottles of water by children—to be repeated year after year during the period of their appearance; but it is very evident that this cannot be extensively practised.

CLYTUS CAMPESTRIS of *Olivier*, (or C. TERMINANS FABRICIUS,) figure 4, is about three fifths of an inch long, of a dark brown color, the elytra varied with ashy down, and having two yellow quadrants near the base. The thorax is rough above, with four yellow spots in the corners, arranged in a square. The thighs are thickened towards the end. The perfect insect appears in Pennsylvania in May and June, and occurs from Massachusetts to Carolina and Mississippi. The larva does considerable damage to fallen chestnut timber, particularly that which is cut for fencing rails. The younger larvæ burrow between the bark and wood, but the older ones penetrate into the wood, forming holes which the rain can enter.—*Pa. Farm Journal.*

ON THE THEORY OF AGRICULTURE, AS FAR AS RELATES TO DRAINING.

THE following is brief and to the point. It is an extract from a lecture delivered in England by the Rev. Doctor Buckland. By-the-bye, we have often thought that our circuit and country clergymen would be still more useful, if they would qualify themselves to deliver occasional lectures on Horticulture, Agriculture, Natural History, &c. He who reads the following attentively, will gain as much as is sometimes gained by listless listeners to prosy sermons:—

The learned Professor then referred to the important operation of draining, as the foundation of all good farming. It was useless to put tons of manure on land that was not dry; in that case it would only float upon the surface, for wet clay would not allow it to go down—it was almost entirely thrown away. Draining rendered the land penetrable by water, and enabled the rain to descend freely through it, carrying to the roots those fertilizing elements of carbonic acid and ammonia, with which rain-water was always charged. Carbonic acid was continually supplied to the air from chimneys, and from putrefying animal and vegetable substances; also from the breath expired from the lungs of animals, and a hundred other sources; it floated in the atmosphere in a gaseous form, and was brought down again by rain. Falling upon drained land, this rain penetrated its surface, and, as he had just said, carried with it to the roots of plants two of their greatest elements of fertility. Fifty years ago, Parliament* had given a premium for draining to Mr. Elkington, and his system, where it was applicable, had answered the required purpose; but it was not applicable so generally as newer systems, for the publication of which the country was mainly indebted to Mr. Smith, of Deanston. He remembered, when returning from Scotland after visiting Mr. Smith's farm at Deanston four years ago, being taken by Sir Robert Peel into a field of his near Tamworth, which was almost swamped with water, and nearly unproductive. He advised Sir Robert to drain it after the manner of Mr. Smith, which he forthwith did, and the result was in the very first year a splendid crop of turnips, and the second year a crop of barley so luxuriant that the stalks could not support the ears, and fell prostrate to the ground. The expenses were repaid in two years, and this worthless field was now a most profitable piece of land. The Rev. Doctor then mentioned another instance of the effect of drainage near Wolverhampton, in Staffordshire, by Lord Hatherton. His Lordship had reclaimed a wild tract of 1500 acres adjoining Cannock Chase, on hills higher than those in East Devon, and had increased its value from 5*s.* to

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* When did *our* Parliament ever give a premium or medal for any improvement in an industrial pursuit, or for any thing except *successful and copious shedding of human blood in war?* The members of Congress are entitled, or rather entitle themselves to take, and we believe (but are not sure) to pocket, if they do not take, newspapers to the amount of some *thirty* dollars each. For each *agricultural* newspaper taken by them Uncle Sam would have to pay fifty cents—perhaps one dollar! Now it would be curious to see how many, or rather how *few* agricultural papers they select. They are ready enough to *supplant* agricultural papers, by distributing the scraps gathered at the Patent Office, but how many do they patronize? Most of them take not one, even when they can do it at the public expense. All go for their *party* papers! And were Mr. Ruffin, the author of the great work on Calcareous Manures, to present himself at the door of the Senate Chamber, on the inauguration of the President, or any other public occasion, he would not be allowed the privileges enjoyed by the lowest commissioned officer of the army or navy—so politic does this republican government consider it to reserve its distinctions for men whose employment is to carry swords and muskets, while the most eminent civil virtues are stigmatized and proscribed as parties rise and fall.

25*s*. per acre. After impressing thus forcibly the importance of draining as the first step in agricultural improvement, the learned Professor proceeded to remark on the application of manures. As the elements of manure could only act on plants when in a state of solution, it ought never to be applied as a top-dressing, except in wet weather. It was common to see manure applied to turnips during the dog-days, when the sky was bright and clear, and not a particle of rain falling. In this case, so far from the manure doing any immediate good, its ammonia was speedily evaporated, being extremely volatile, and passed into the atmosphere, instead of to the roots of plants. In a dry season, if manures were used at all, they ought to be buried in the ground, and not applied as a top-dressing; in rainy seasons the virtue of manures descended with the rain-water, to the immediate benefit of the growing plants. There were two advantages to be derived from draining, which were—time and money. He who was always behindhand could not be a good farmer. The early farmer takes his commodities early to market from well-drained land, which is fit to be worked at almost any time, and has threshed his barley, and converted it into cash, while the late farmer's crops are not yet ripe for the harvest. No farm on a wet clay soil can produce half the corn it is capable of growing if thoroughly drained. Referring to different kinds of manure applied to land after it was prepared by drainage for receiving it, the Professor observed that he need hardly say that the best of all manures was farm-yard dung, though he was sorry to remark the farmers did neither produce nor preserve so much of it as they might easily do. Farm-yard dung was the best of all manures, because it gave back directly to the soil the elements of the plants that had been consumed by cattle as their food. But, besides the manure produced on his own land, the good farmer is obliged to borrow and fetch from a distance the elementary substances of imported artificial manures. The farmers of the east side of England go to London for bone-dust, and to Holland for rape-cake and oil-cake. This oil-cake, together with straw, is used for the winter food of oxen in their farm-yards, which are thus annually charged with an abundance of rich manure.

TOBACCO.

THE TOBACCO INSPECTION WAREHOUSES IN NEW-YORK—APATHY OF PLANTERS—CANADA RECIPROCITY BILL.

A visit to the New-York Tobacco Inspection Warehouse fronting on the East River, under the management and supervision of the proprietors, Messrs. Pearce and Jarvis, prompts us to say that, as connected with an important branch of agricultural industry, the buildings are large, substantial edifices, covering twenty-four lots of ground, and are some five or six stories high. They are capable of storing about nine thousand hogsheads of Kentucky or Virginia tobacco, and the arrangements for examining, sampling and conducting the business seemed to be perfect in every particular. Mr. Pearce, the senior partner of the concern, is a Marylander, and for many years was extensively engaged in the tobacco trade from Baltimore to Europe, and resided for some time in Germany, for the purpose of perfecting his knowledge of that trade, and in attending to the interests of a house he was connected with in this country. About fifteen years ago, he was induced to remove to New-York, for the purpose of aiding a gentleman of considerable enterprise in establishing an inspection, which was got up under many disadvantages and sacrifices, but which has proved to be eminently useful, popular and conducive to the convenience of all who are concerned in the vending and purchasing of leaf tobacco, the trade in which is every year increasing and growing more important.

Although the inspection and warehousing are not now regulated by any legal enactments, and consequently, not compulsory; yet all the tobacco arriving at the port for sale is regularly sent to the establishment, where it is sampled or inspected, weighed and marked with care and accuracy, and

stored until called for by the manufacturer or shipper. The merchants, we understand, find this a safe, cheap and satisfactory mode of managing this important article of their trade; and the establishment has now become indispensable in facilitating its operations.

The tobacco received annually varies from nine or ten to twelve thousand hogsheads, principally the growth of Kentucky and Virginia; more than one half of which is taken out for home manufacture and consumption, and the residue exported to various parts of the world.

It is somewhat remarkable that the Maryland planters have not, as we are told, turned their attention, if only in the way of experiment, to the New-York market for the sale, in part, of their tobacco, which is suited for shipment to those countries in Europe with which so important and extensive a trade exists. It is believed by many that if an agency or agencies were established in that great commercial metropolis of the States, for the sale of Maryland tobacco, the highest prices would be realized. Baltimore seems to have monopolized the entire trade in Maryland tobacco, with what advantage to the grower he should best know. The greater the competition and the difficulty of combination among purchasers, the better for the planter. But, unfortunately, instead of a policy that will compel the consumer to go to the producer, to ask what *he will take*, the whole policy of our government, and the whole tendency of "free trade," as it is understood, is compelling our producers to go to foreign manufacturers and consumers, to say and to ask, "Here, sir, I have brought all my produce to your very door, until the toll and charges have nearly eaten up the grist. Pray, my dear sir, tell me *what you will graciously give me* for what remains, and let me go home, to come again next year and place myself in the same predicament."

Here, while the British are levying on American tobacco duties to the amount of some $15,000,000 or $20,000,000, Canada is asking, through her agents and ministers, only to open our gates wide enough for the free admission of her wheat and corn; and what says the American planter? Not a word—dumb as an oyster! even giving consent, as far as silence can do it; and were Major Jones, or some committee of agriculture, even to hint at the humbuggery that is going on, they would be forced to strike it from their report, as being a *political matter!!!* on which clodpoles have no right to express an opinion. As if men associated to guard the interests of agriculture were not bound in all their deliberations to despise the narrow and sordid calculations of political demagogues, of whatever party, and to watch for and defend themselves against the *wiles* as well as the force of foreign powers. But it is understood that the British Envoy's—entertainments are magnificent; and then he's—*so courteous! so condescending!* Ah, what a wise—what a proud people we are! so vigilant! so self-respectful!

We learned that the receipts of the last year (1850) at the New-York warehouses were nearly 14,000 hogsheads, and that the stock on hand at the inspection on the 1st January, 1851, was 6,300 hogsheads. The deliveries in 1850 for home consumption and exportation to foreign countries, amounted to 13,500 hogsheads.

To Kill Lice on Cattle.—Some recommend to kill them with mercurial ointment, but that is dangerous. Better sprinkle wood ashes; but as prevention is better than cure, the best thing is *good keep*. Bad keep is the disorder of which lice are the symptom and the fruit.

COST OF DIFFERENT MODES OF TRANSPORTATION.

THE *Journal of Commerce*, printed at Louisville, Kentucky, contains the report of an address upon Railroads, delivered by Mr. Robinson, at the court-house in Lexington, on the 8th instant. The speaker institutes a comparison between the cost to the farmer of different modes of transportation in getting his produce to market. For this purpose he inquires into the expense of marketing fifty tons at a point one hundred miles distant, along a turnpike and a railroad. He estimates the cost where the latter is used, including the personal expenses of the farmer in going with his crops to dispose of them, four times a year, at $165, having previously calculated the expense of marketing the same quantity by turnpike at $850; and then proceeds:

"Deduct this $165 from $850, the cost of the farmer along a turnpike, and we have a positive difference of $685 in favor of the farmer along a railroad, and against the farmer along a turnpike. The sum of $685 will pay the interest, at six per cent., (which, I believe, is legal interest in Kentucky,) upon the sum of $11,400; consequently, the farm along a railroad is worth just $11,400 more than a farm along a turnpike, supposing all other things to be equal.

"If such is the difference between railrords and turnpikes, what must be the difference between railroads and common dirt-roads, where the cost of transportation is double the cost of the same work upon turnpikes. I was informed a few days since by one of the wealthiest and most intelligent farmers in Mason county, that he paid last winter twenty-five cents per hundred, or five dollars per ton, for transportation of hemp eighteen miles. This will amount to over thirty-one cents per ton per mile, or more than double the cost of the same service upon a turnpike.

"Supposing the statement I have just read to you to be a correct one—and I believe it to be such—then *the land of the farmer who has a railroad, and is one hundred miles from a market, is worth just as much per acre for agricultural purposes as is land of the same quality upon a turnpike, nineteen miles from the same market; and is worth just as much as is land of the same quality situated upon a common dirt-road, (such as you have in Kentucky,) nine miles from the same market.* This, gentlemen, is one of the reasons why railroads are of benefit to the farmer. This is one reason why his land is increased in value. There are other reasons of fully as much importance. The farmer can send to market articles by railroad that it is impossible to send by wagons and turnpikes. He can send bark, wood, ship-timber, shingles, staves, lumber, honey, butter, &c., and a great variety of articles he cannot dispose of otherwise. The same benefits, in a less degree, accrue to the farmer, in the shape of the decreased cost to him of the articles he must buy for his own use; such as salt, sugar, iron, teas, coffee, clothes, &c., and, in fact, of all articles he uses, that he does not raise.

"Salt is worth in Paris or Lexington fifty cents per bushel, iron five to six cents per pound, coal twenty cents per bushel. These same articles can be purchased in Maysville at thirty cents for salt, three to four cents for iron, and five to six cents per bushel for coal. The increased cost to you here is simply transportation, as the merchant here charges the same per centage in profits that the merchant in Maysville does. With railroad communication, your salt and iron would cost you but a trifle more than it would in Maysville, and your coal would cost you ten or eleven cents per bushel, instead of twenty to twenty-one cents, as is at present the case."

After making some remarks upon the advantages of transporting live stock by railroad over driving it to market, Mr. Robinson proceeds:

"Your counties are now forced into the stock-raising business. They cannot raise grain and transport it to market, as it costs you more than you get for it. You are obliged, therefore, to feed it to stock and work it off, as it is the cheapest way in which you can get the grain you now raise to market. Build your railroads, and you will find grain-raising much more profitable to you than stock-raising, and will, therefore, raise grain instead of stock, while stock-raising will pass off to more remote and less favored regions.

"Railroads create a revolution in your products, for the simple reason that it is more profitable for you to raise other products after the roads are completed, than is the case before they are built. In illustration of this, I will call your attention for a moment to the workings of the great New-York and Erie Railroad, in New-York State. Prior to the construction of this road, the farmers in the counties nearest New-York, upon

the line of road, raised grain and butter—every one has heard of Orange county butter.

"As soon, however, as the railroad was opened through these counties, the farmers discovered they could make more money by sending other articles to market; or rather by sending their products in a different shape; and the consequence is, that now, instead of sending grain and butter, they send milk to New-York. This road brings daily into New-York nearly one hundred thousand quarts of milk; much of it is brought a distance of one hundred miles. The farmers there found out that the products of their farms were worth more in the shape of milk than in any other way; and it has proved itself to be twice as valuable to them in this shape than in any other. The consequence is, that the farms in that region of country have increased in value from $40 and $50 an acre to $100, and even $150 per acre; while the farms still more remote from New-York, say two hundred and fifty or three hundred miles, which, before the construction of the road, were worth from ten to fifteen dollars an acre, now readily bring from fifty to seventy-five dollars per acre."

It does not concern us to inquire whether the above calculations are strictly accurate or not. The result to which they lead is one that has been verified by the experience of every region in which improved modes of transportation have been substituted for inferior. The whole saving, in the cost of getting the produce of the land exchanged, has been added to its value. Nobody has been injured by the process, but everybody has been benefited, for the cost to the consumer is not increased. Agriculturists are beginning to appreciate their interest in bringing themselves into proximity with their customers, by facilitating and cheapening the cost of their going to the latter. It is a strange thing that they will not take another step, and accomplish the same end by bringing the consumer to them.

The cost of a railroad of one hundred miles in length is cheaply estimated at two millions and a half of dollars. The amount of its advantage to the occupiers of the land lying upon it, is that it reduces the effective distance of each of them from market in the proportion of one hundred to nineteen, as compared with the turnpikes which we may suppose to have previously existed. The most distant upon the line has for all financial purposes moved his land to within nineteen miles of the point where its products must be sold. But it is plain that this advantage diminishes, as we recede on either side from the line of the road, in the inverse proportion. The farmer living off the track can compete with him at its extremity only by keeping within such a line that the distance which crops have to be hauled by team increases but nineteen hundredths of a mile for every mile that the railroad transportation is diminished. This being the case on each side, it follows that the effect of the railroad is summed up in the statement that it has made a parallelogram one hundred miles long and nineteen broad, of the same value as the nineteen miles square, immediately surrounding the market, previous to its construction.

The amount expended in the construction of one hundred miles of railroad would pay for the erection of twenty-five manufacturing establishments, costing one hundred thousand dollars each. It would have made twenty-five mills capable of working up two thousand bales of cotton each per annum. It would have made three times that number of furnaces, each of them capable of producing five thousand tons of pig-iron per week. If we suppose it divided equally, we should have fifty mills and furnaces scattered over a surface of nineteen hundred square miles—one to every thirty-eight square miles—about the size of an ordinary township. This would bring every producer within seven miles of a market, and reduce his expense of transportation, as compared with the reduction effected by a railroad, to less than one third.

But the question may be started in respect to the extent of such a market. This there is no mode of estimating, for it constantly increases. The operatives who work in the factory or mill draw about them those who make their clothes, their shoes, and minister to every other want except that of food. Each of those who comes for that purpose brings with him wants of his own, which require the services of still fresh artisans, and all of them must be fed, and clothed, and housed, and kept warm by the labors of the neighboring farmer. The progress is in a geometrical, and not simply an arithmetical ratio; and the only way in which a proper conception of its rapidity can be obtained is by watching the growth of the villages which cluster about manufactories.

Those who have seen, or in the South are now witnessing, the wonderful effect of such towns upon the surrounding country, will have no difficulty in believing that the market which one of them supplies is better and surer than that small share in a distant though larger one which is available to the man who has to go a hundred miles to reach it, and meet there the cultivators of a circle of twice their diameter.

But we had no further purpose than to accumulate testimony to the general proposi-

tion that all the freight of agricultural products is a charge upon them, and upon the land which bears them. It follows from this, that a recommendation to the farmers and planters to depend upon foreign markets is equivalent to asking them to keep their lands at the lowest possible value to which they can be reduced.—*Republic.*

THOUGHTS AND FACTS.

Stall-feeding Cattle.—In a valuable work on practical farming, the writer (Hillyard) says: Beasts should increase in the first month sixty-four pounds, second, eighty pounds, and the last fortnight forty-eight pounds. James H. Leigh, an English farmer, gives a very minute account, embracing every particular of stall-feeding—eighteen Durham bullocks and ten Durham cows for ten weeks from 11th November. One bullock died of pleuro-pneumonia in the last week.

The average weight gained by the twenty-seven beasts in five weeks was two hundred and eleven twenty-sevenths pounds, at a cost of $17 60 each.

The feed was daily:

4 lbs. oil-cake,
4 " barley meal,
10 " cut oat straw,
20 " turnips,
2 " hay, at night.

He then took in hand sixteen Scots and Welsh bullocks, one Durham ox, one long-horned heifer, and twelve cows and heifers, from the 5th of July to the 21st of April; the average gain of each beast was three hundred and three and twenty-one thirtieths pounds, at a cost of $22 32 each, in ten weeks and five days. The regular feeding was commenced the 3d, but they were not weighed until the 5th of February. In each case every beast was weighed weekly, and every item of his food every day!

The English agricultural books abound with experiments equally extensive and exact. What would prevail with our American farmer to take the same pains? Would a silver goblet? How much easier to say a thing was as big as a lump of chalk!

Well, says the reader, what's the value of this information? Why, it's worth the space, if only to inform those who never even guessed at it, how much a bullock ought to gain in a given time. How without occasional experiments can the farmer tell the *cost* of his meat per pound? He knows what he gets, but does he know *whether it will pay?* And without knowing that, may he not be *sold out* before he knows what hurts him?

The Habit of Guessing.—To show how many men go through life guessing at every thing, at the last Maryland Cattle Show an old and most respectable farmer was in attendance, exhibiting some of his cattle. Mr. Patterson's two yoke of superb Devons were passing at the moment, and we asked the respectable old gentleman *how much* he supposed the two yoke *could* haul, on level, smooth ground? "Why, he did not know—he reckoned they could haul *a ton!*" When we told him we had no doubt, from what we had seen in New-England, that either *yoke could haul three tons on hard level road*, he was doubtless amazed at our credulity, or something worse. Thus it is that farmers go through life without appearing to be sensible that if they

would read, reflect, investigate, think, they might be adding every day to the stock of useful knowledge, *in the very line of their business.*

How to make Animal and Wooden Machines.—Reader, do you wish to know? We'll tell you. *Make time valuable—enable men to sell their labor high!* How is that to be done? By drawing men close together and diversifying employment. Thus you create demand for labor, and when a man's time becomes valuable and in proportion as it is valuable, he will seek to work with the most perfect machinery. He can't *afford* to follow a bad plough, or to drive weak animals. To turn his time (which to him is money) to the best account, *all his accessories must be of the best.* His horses must be fast and strong, his oxen must be powerful, and he must *know their power*, that he may task it to the full; for he knows and feels that he must accomplish the most work that is possible in the shortest possible time. The less employment is diversified, the cheaper the labor, and the less important that the tools and implements should be the most perfect that can be. How long could the farmer stand upon his legs in New-England who would know no better than to estimate one ton as a load for two yoke of large oxen?

Hence it is in New-England, where the loom and the anvil are near to the plough and the harrow, you see all the implements and appliances so perfect—houses, railroads, oxen, wagons, horses, roads, bridges, fences. If you want to see bad roads, bad gates, bad carts, poor horses, little oxen, slow men, imperfect machinery, ragged harness, slow driving, go where all are at one pursuit—where, therefore, men scatter and lose the power of combination—where, in a word, time is of so little value and labor so *cheap* (regarded by some as a blessing) that men can afford to work with bad and imperfect machinery, and where, consequently, every art and every industry declines. Ample reward to labor is another word for a prosperous country—cheap labor is a curse. The ragged Hindoo works for two sous a day!

JOHN BULL'S LAST CATCH-PENNY.

From the outset we have cautioned our readers against having any thing to do with John Bull's last contrivance for the maintenance of a system which looks to increasing the number of *middlemen*, by separating the producers of the world from the consumers of the world. The great Exhibition—the World's Fair—was a trap for catching pennies, having for its object the filling of the purses of the people of England, at the expense of the rest of the world, and thousands of our countrymen have fallen into it, having incurred large expenditure for the purpose of aiding in the occupation of the space assigned to this country within the walls of the Crystal Palace. What success they have had in conciliating the good feeling of John Bull, may be seen from the following paragraph, which we take from the *London Times*:—

What idea of Jonathan is to be gathered from his "notions?" And can we detect in the offspring the lineaments of its parent's face? England is not given to boasting and swaggering; she generally understates her strength, and studies moderation of language about herself, though she has some excuse for being proud. Her republican progeny are not so modest, if one may judge from the wings of that very aggressive American eagle with which the eastern end of the nave is decorated. The king of birds is hovering over a set of "notions" spread out very sparsely beneath him; and the visitor is somewhat astonished to find him making so vast a demonstration over a space so unoccupied. The American department is the prairie-ground of the Exhibition, and our cousins, smart as they are, have failed to fill it. They cannot yet keep pace with the great strides of

European industries, and even the seven-leagued boots, if they had them, would not enable them to do so, for some generations to come. *They are growing, however, and will be a great community by-and-by. Let them, therefore, await the future with patience and humility.*

In obedience to the commercial laws of England, we are daily closing our mills and furnaces, and daily diminishing our power to compete with her in supplying the world with cloth and iron, and our reward for all this is, to be told that we shall be "a great community by-and-by," but that we must content ourselves for the present with "patience and humility." Assuredly, the world has never yet seen a nation that wasted its resources and prevented the growth of its power, to the extent that is now being done by the farmers and planters of this Union. They richly deserve, as we think, to be taught a lesson of "patience and humility," and it *will* be taught as soon as we shall have sufficiently supplied the markets of Europe with our certificates of debt.

ON THE CULTIVATION OF TOBACCO.

[*Concluded.*]

OF STRIPPING AND PRIZING.

STRIPPING is begun as soon after the plants are thoroughly cured and seasoned, as the convenience of the planter will permit. It is taken off the sticks in proper season or order, and packed in a large bulk for this purpose, and generally in higher order than is proper for prizing, which enables the strippers to handle it with less waste, and to tie it more neatly. There are two facts generally believed to exist, in relation to the order of tobacco, which are unaccountable. One is, that tobacco, *in order*, or in a moist state, is no heavier than when dry. The other, that if it is taken down and bulked, as it is going out of season, that is, as it is passing from a moist to a dryer state, it will return in the bulk to the highest state of order it had previously acquired. These opinions, however, seem to have been established more by prescription than recent experiment, for I can find no person that will absolutely assert the facts upon his own experience. But be it as it may, the latter fact is so generally believed as to be attended to in bulking tobacco.

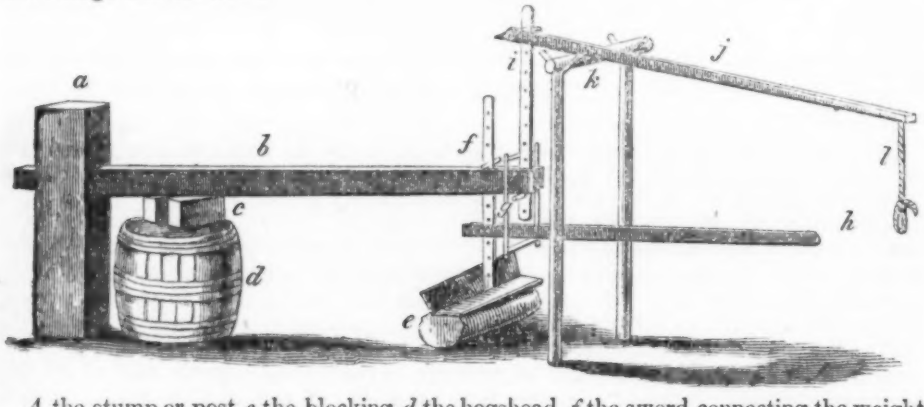
In stripping, the best planters make two qualities besides stemmed. For this purpose, every plant passes through the hands of the sorters, (the most experienced and judicious of the laborers,) who pull off the two first, or ground leaves, without looking. Upon examination, the remainder of the plant may be found fit for the first class; perhaps two more leaves are to be taken off, or perhaps the whole is only fit for the second class. In this way the first class is obtained, the leaves previously pulled off are again sorted for the second class, and what is unfit for this is stemmed.

No definite idea of the quality of the different classes can be well conveyed by description. It can only, and soon will be, acquired by observation and experience. The bundles of each consist of four or five leaves neatly wrapped around the head with another leaf. The stemmed tobacco (about two thirds of the stem only are taken out) is tied in large bundles, and when packed in the hogshead for pressing is untied and laid loosely, but in straight and uniform layers.

After stripping, some planters hang up their tobacco again upon sticks drawn smooth and somewhat to a feather-edge, and as it comes in proper order for prizing it, is taken down and bulked, and closely and effectually covered till the time of prizing arrives. The months of April and May are thought the best time for this. Others pack their tobacco in double winrows, that is, slightly lap the tails of the bundles, placing the heads on the outside, and thus raise a bulk of three or four feet in height. It remains in this situation well weighted, but oftentimes without cover all the winter, and perhaps gets completely dry; but returns in proper order for prizing in the warm weather of April and May. It is a matter of much doubt and dispute, which of these two modes is the best. Perhaps the latter is to be preferred, because it is the least trouble, provided the planter has plenty of house-room, and can so order it as to leave the winrows entirely free from interruption. Other planters, more careless, carry on the operation of stripping and prizing to-

gether, without due regard to the order of the tobacco, which may account for the excess of inferior qualities, and diversity of prices exhibited in our markets.

Prizing is the last operation, but not the least important in the care and attention it requires. The size of our hogsheads is prescribed by law. They must not exceed four and a half feet in height, nor thirty-six inches in the diameter of the heads. In these we generally attempt to press 1500 pounds, but we oftener fall below than go over it. The average is perhaps not more than 1350 lbs. Our prizes are of the cheapest and simplest construction, generally fixed by the laborers who use them, and not exceeding two or three dollars in entire cost. The stump of a tree is generally used, instead of a post in the ground, until it rots, and the hogshead is protected by a temporary shed, or a light portable roof straddled across the beam. I subjoin a sketch of the one most commonly used. This you will observe operates by an unceasing suspended weight, capable of being increased by the addition of stones to any required extent, and which is suffered to settle gradually to the desired point, by which all danger of bruising from sudden and violent pressure is avoided. The important points in prizing are, to pack the tobacco neatly, in straight and regular layers. This is best done by putting in only one bundle at a time, pressing and squeezing it closely through the hands as it is done, to make it occupy less space, by which it will exhibit a better appearance when it is opened for inspection. To make it descend always on a level in the hogshead, by never suffering the beam to be depressed below a horizontal position, and to cause the tobacco in prizing, not to leave the inside of the hogshead, which can only be effected by having different sets of press boards, corresponding to the different dimensions of the hogshead between the buldge and the head.



A the stump or post, *c* the blocking, *d* the hogshead, *f* the sword connecting the weight *e* to the first lever *b*; the second lever *h* is applied to the first by the frame *g*; by pulling the rope *l*, the sweep *j*, working on the gallows *k*, raises the lever *b*, as the sweep and first lever are connected by a sword *i*. If the weight put in *e* is too great to be raised by the power applied to the second lever *h*, the design of the sword *f*, not being fixed in the ground, would be frustrated; the weight, however, may be readily adjusted to your power by putting more stones in *e*, or taking some out of it.

DUTY ON IRON.

The *Baltimore Republican*, a Democratic paper, says :—

There are doubtless many articles which will bear heavier duties than those levied by the present tariff, without diminishing the revenue, but on the contrary increasing it. If so, we see no impropriety in raising the duties. Iron, at its present foreign value, will bear a duty of sixty per cent. without diminishing the revenue from it; but if the home value be substituted, thirty per cent. is as much as it will bear. If the foreign valuation be adhered to, we think that the duty on iron should be increased to sixty per cent. whilst it continues to sell at the present low rates in England, with provisions for decreasing *the duty* in proportion to the rise of its PRICE. This sliding scale of ad valorem duties we think far preferable to specific duties, as the latter taxes a common article at the same rate that it does a costly and valuable one. In increasing the duties on certain articles, with the view of increasing the revenue, instead of shutting out foreign competition, we see no departure from the Democratic platform.

PEAT-CHARCOAL AND MANURE.

PEAT-ASHES, WOOD-ASHES, SOOT.

I HAVE been in the habit of using all these for the last twenty years, to the great benefit of all sorts of plants; but if we could purchase this peat-charcoal mixed with night-soil, how much more beneficial it would be, even to gardeners. To the farmer it will far surpass guano in its fertilizing properties, and being of easy carriage, it can be sent to the remotest part. As for the expense, I hesitate not to say, from the millions of tons lying waste, both in Ireland as well as Scotland, that the price per ton on the ground where it will be burned would amply pay at ten shillings per ton—nay, more than pay. There is ten times more peat found above, than coals underneath. I know one estate in Scotland where several hundreds of acres are covered with solid black peat, varying from ten to twenty feet deep, containing millions and millions of tons, belonging to Sir David Dundas, the Judge Advocate-General. Therefore, I think, I have made out a good case to prove the cheapness, that in time it can be bought where it is charred. We all know that there is a deal of labor in bringing the coals to the pit's mouth, and still they are sold for the low price of from 8s. to 12s. per ton there. No one, as yet, can at all arrive at the mighty benefits that Mr. Jasper Rogers's mixture will do—which I shall christen, "Rogers's British Manure." In the first place, it will be a mighty benefit to the poor in those districts where the peat is charred; it will also be of great benefit to the landlord; it will also be very beneficial to the health of the country to have the peat districts drained, (as attention is sure to be paid to that, on account of the value of the hitherto valueless peat;) it will employ many hands in the shipping interest—as well as when it arrives at the various coast towns. No one can make any calculation of the benefit it will be to thousands, even before it is put on the land; and no one can have a doubt of its value, as a first-rate manure, afterwards. For instance, look at what a poor farmer has to pay, in remote districts, where he is far removed from towns, for a wagonful of solid rubbish, (all the ammonia, all fertilizing matter gone,) and a whole day lost, with a man and three horses, in bringing this load of delusive and high-priced rubbish home—and a pound paid for it in the first instance. Farmers, with free trade in full operation staring them in the face, cannot stand this any longer; therefore, great praise is due to Mr. Rogers for bringing this valuable mixture before the public in such a spirited way. The next point to be considered is, how is the manure to be made? As far as I have read the plans for the drainage of London, in the *Daily News*, none of them, in my opinion, will answer, on account of the enormous expense and difficulties to encounter, and having their works at different points instead of one. It is well known to every one that the Thames is the lowest part, and the only course to carry off all sewerage; therefore, I should simply advise sewers to be made on each side of the river. The north sewer could not pass any farther down than London Bridge, where I would carry several iron sewers across the bed of the river, and empty into the south sewer; the south sewer following the river's course, and striking off for Plumstead Meshes, where the works and reservoirs could be formed; a canal then cut to allow the clear water to run down to the river, as well as to allow the peat-charcoal to arrive at the works, and there mixed. The charcoal, being dry, would at once absorb and take up all the gases and the moisture of the solid, and would be very little trouble in the drying process. But there are hundreds of towns and villages where the charred peat would be used in the open privies and dunghills, and would at once absorb all those valuable gases for the land, although highly deleterious to the air when allowed to escape; therefore, I hope that Mr. Rogers will meet with that support which he so justly deserves from Great Britain, well knowing how difficult it is to surmount the prejudices of even those to whose after-benefit it will be sure to do good; hoping the press, in general, will see the great benefit that the above splendid manure will be, not only to the land, but the laborers, and the country at large.—*James Cuthill, Florist, Camberwell.*

[Mr. Cuthill, in a note accompanying his paper, dated 21st instant, says: "Should you mention the Irish peat-charcoal again, don't forget that letter of mine, which you published in the beginning of the year, to Mr. Smith, of Deanston." (See *Scottish Agricultural Journal*, No. 1, in which he alludes to vast quantities of peat-bog in the island of Lewes, from one to twenty feet deep, which he suggests should be burned in heaps, along with sea-weed, shell-sand, &c., after the manner of burning bricks.) "I am now giving the Irish peat-charcoal, mixed with night-soil, a trial; and you may depend upon it, that the two combined is far surpassing guano. I have strawberry plants in pots;

geraniums and many other plants growing luxuriantly, with a small quantity of the mixture in each. But the plants, in this mixture, are finer plants than the others, and have much finer roots. Even peat-ashes are valuable, as mentioned in my letter to Mr. Smith, in your paper. I am using charred peat, ever since Mr. Rogers's lecture at the London Mechanics' Institution, down the privy, and have not been annoyed, in the least sense by smell.]—*Scottish Agricultural Journal.*

DIRECT IMPORTATIONS.

We learn that the principal importing merchants of Charleston will, this summer, go to Europe, and lay in their stocks for the coming season, to be imported direct. It is a good beginning, and will, we doubt not, find imitators in other Southern cities, as well as meet the sympathy and support of the Southern people.—*Charleston Mercury.*

How much better would it not be for the people of South Carolina to determine to adopt measures that would enable them to import machinery, for the conversion of their cotton into cloth, to be tended by spinners and weavers who should consume home-grown food, thus giving them a direct trade with the consumers of cotton goods throughout the world, instead of limiting themselves, as now, to supplying British spindles and looms, tended by persons who consume Polish and Russian food, and wear the cotton of India!

BEAUTIES OF THE COLONIAL SYSTEM.

We have had occasion frequently to call the attention of our readers to the fact that the people of the United States are now the chief supporters of the colonial system. Their food and their cotton go to England in British ships, to be disposed of by British merchants, transported on British railroads, converted into cloth by British looms, and retransported to the place of consumption on British roads and in British ships; *and at every stage of the process* a contribution is, in one form or another, exacted for the support of British fleets and armies, employed in the constant deterioration of the condition of the people of Ireland, India, and of all the other countries dependent upon Great Britain; and the result is seen in the fact that each and every of the countries so dependent is rapidly becoming exhausted, and its people are becoming pauperized and enslaved.

We pray our readers to study the following sketch of recent proceedings at the British colony of the Cape of Good Hope, and then to remember that they themselves are the chief contributors to the maintenance of the armies employed in destroying the houses and wasting the lands of the peaceful and industrious Hottentots:—

The English in South Africa—Results of British "Civilization."—It has been remarked by some one that the chief result of the extension of British rule and "civilization" over India, has been to drain it annually of one hundred million pounds, to be spent chiefly in England. Some of the English papers are making disclosures relative to tyrannical proceedings at the Cape of Good Hope, by English officials, which do not speak well for those who are continually flaunting before the world the beneficial results of the extension of English power.

It is charged that the English Governor, Sir Harry Smith, had compelled the native chiefs to give up a large portion of their lands.

At the public meeting of the London Missionary Society in London, the Rev. J. J. Freeman, Secretary of the Society, who has been on a visit to the Cape, stated that Sir Harry Smith, at a public meeting of chiefs, held up a treaty and tore it to atoms, saying, "There go the treaties."

He also charges Governor Smith with forcing the Griquas, by intimidation, to sign away large sections of their country, telling them with solemn oaths that unless they signed the treaty by five o'clock that afternoon, he would hang them up to the beam in the room where they were then standing.

When Sir Harry Smith heard that some of the Christian Hottentots had joined the Caffres, he styled them a set of "psalm-singing rebels."

It is further stated that the Government had burned the habitations of a number of Hottentots who had been heretofore faithful to the English. The account says:—

"The Hottentots entreated for their friends in vain; nothing availed—neither the cries of the children, nor the tears of the mothers, some of whom were in childbed with babes of three or four days old, on one of the coldest days of the inclement season; and that on a Sunday, the day of peace, rest and prayer, two hundred and fifty persons were burned out and driven from their homes."

Mr. Freeman also denounces the annexation of territory in the interior of Africa, as tending to involve the inhabitants in savage wars.—*Exchange paper.*

ON THE FOOD OF PLANTS.

BY A FARMER.

If we imagine a soil properly pulverized, and yet retaining such a degree of firmness and consistency as to give a secure hold to the roots, a plant situated in it will find a matrix at once suitable to receive and transmit the atmospheric influence, and also to supply the moisture necessary for the wants of the plant. But if the mineral ingredients of such a soil are insoluble, and fixed, (as it is expressed in chemical phraseology,) a plant will certainly live in such a situation by deriving much of the food it requires from the atmosphere. But vegetation in such a situation and under such circumstances will not suffice for the farmer. It is only by means of certain soluble ingredients in the soil that this normal state is attained; and if the soil does not contain these soluble substances, or does not contain them in sufficient quantities, it then becomes our business to supply them. These supplementary substances, (if the expression may be allowed,) this sustenance for the plants, to which the name of "manures," or "stimulants," have been given, according to the point of view under which they are contemplated, is therefore an important subject for study. After having given the plant a suitable dwelling-place, we must also supply it with suitable food: in this respect plants resemble animals. But in order to understand what we are about, it may be advisable briefly to recapitulate the principles of vegetable physiology on which this doctrine is based.

If we call to mind the mechanism of vegetation, we find that water, containing various substances in solution, penetrates by endosmose into the roots, rises from thence by capillary attraction under the bark, where it is called *sap*. When it reaches the leaves, a portion is removed by evaporation, and the solution of course becomes more condensed. Under the action of air and light, the free carbonic acid it contains is decomposed, carbon is fixed in the plant, and oxygen given off into the air. During the night, on the contrary,* the oxygen of the air is absorbed by the leaves, combined with the carbona-

* This assertion, that during the absence of light growing vegetables vitiate the air, is to be received with some caution, as it is by no means well established.—Translator.

ceous elements of the sap, to be again decomposed at the return of light. The solid matters present in the sap are deposited, according to their special natures, round the cellular vessels, or on the surface of the leaves, or at certain determinate parts of the structure; the superfluous or injurious matter being carried off by the descending sap, and eliminated from the roots as excrement.

It is unnecessary to follow the sap through the various changes its elements undergo—the successive changes by which sugar, mucilage, gluten, albumen, and the various vegetable acids are formed; this part of the subject belongs to vegetable physiology.

All soluble matters within their reach being absorbed by plants, (a fact well ascertained, even in the case of virulent poison,) which of these substances are so essential to vegetation that plants in general cannot be deprived of them without suffering? And, in the second place, do certain kinds require certain substances to be present in the soil, which are not absolutely necessary to others? In a word, is there in vegetables a universal food, so to speak? or does each plant require a special one? These are the questions which we have to examine.

1*st. The Food necessary for all Vegetables.*

The attempt has often been made to ascertain by experiment the substances essential to vegetation, or those by means of which the vegetable can live and grow, though deprived of all others. It has at least been ascertained that a plant cannot live without oxygen and carbonic acid. In an atmosphere deprived of moisture, a plant will not live; water is therefore also indispensable, not only on account of its solvent powers, but also because its elements enter into the formation of many of the products of vegetation. As for carbonic acid, that which is absorbed by the leaves, though sufficient to support life, does not appear to be enough to secure the full development of plants, as the following experiment (which also goes to prove the importance of vegetable matter in the soil) will satisfactorily show.

Two boxes were taken, the one containing soil calcined, so as to destroy all organic matter; the second contained soil in its natural state. In both a few grains of peas were sown, and it was observed that the plants in the former were much less vigorous than those in the natural soil. Upon examination, the first contained ·46 of its weight, and the second ·57, or rather more than half its weight, of carbon. This difference was undoubtedly owing to the carbon present in the second box.

In all the experiments which have been made, none have as yet been undertaken under such circumstances as to exclude nitrogen in its simple form, so that we cannot speak positively as to its importance. But as it is universally present in the form of ammonia, and as it enters largely into all the more important vegetable products, we may safely affirm that nitrogen is requisite for plants.

Thus, oxygen, water, carbonic acid, and nitrogen, are the primary and indispensable elements of vegetation. The action is undoubtedly assisted by the important agents heat and light, and in all probability by electricity.

Chemical analysis demonstrates the justice of this conclusion. Amongst a great number of substances, varying with the species, the climate, and the soil, these important ingredients are always present. They exist in the form of starch, gum, sugar, manisite, ulmic, gallic, acetic, malic, citric, and other acids, and neutral substances. In a word, they form the basis of the almost endless variety of organic compounds which modern chemistry has brought to light.

2*d*. *The special Food of Vegetation.*

It might have been thought that the above-mentioned substances would have sufficed to give stability and solidity to plants, especially as carbon forms such a large proportion of the vegetable tissues. If even this had been possible, the framework of a plant is not exclusively composed of carbon, certain alkaline and earthy matters being always found to be present along with the organic portion of vegetation. The difficulty exists in the varying proportion in which these alkaline and earthy substances are found, not only in different plants, but even in the same species when grown upon different soils. They are to a certain extent interchangeable amongst each other, so that it is difficult or impossible to say which of them are absolutely indispensable to vegetation. It is even possible to imagine a plant *existing* without any of them, in the same way as a mammiferous animal may live after all the solid portions of bones have been removed.* In both cases, though life might be maintained, neither the animal nor the plant could fulfil their destined uses. Besides the materials necessary to support life, as oxygen, water, carbon, &c., there are therefore others, which, though of less importance, are necessary to enable plants, as well as animals, to arrive at full perfection. It is therefore of importance to ascertain how these are introduced into vegetation.

The plant lives and grows by absorbing into its substance the various gaseous elements that exist in the atmosphere and the soil. The water absorbed by the roots contains, in solution, a considerable quantity of the alkalies and earths; drawn upwards towards the extremities of the plant, this solution is evaporated by the leaves. The various solid matters which are thus introduced, after passing through a great number of chemical changes, are then by the flow of the sap dispersed over the plant. Are we then to consider these substances as excretions which the vitality of the plant is able to carry no further—or are they essential to the organization of the plant?

If the substances of which we speak are only to be regarded as excretions, or as an attempt made by the organs to relieve themselves of useless matter, it becomes necessary to explain how it happens that potash and soda, added to a soil deficient in alkalies, so powerfully assist vegetation. We can only understand the action of these substances, by supposing them capable of supplying an element necessary to the growth of vegetation; and perhaps they also in some way or other assist the chemical changes which are going on in the interior of the plant.

For certain plants it is necessary to admit the value of chalk or lime; and the importance of gypsum to certain of our cultivated plants is also sufficiently well known to prevent it from being considered a substance to which they are indifferent. If it be also considered that silica, alumina, (?) phosphoric acid, oxalic acid, &c., are not deposited indifferently in all portions of the plant, but in certain special determinate organs; that there is, therefore, on the part of these organs, a certain power of choice, a vital action, which enables them to separate those substances from the sap which they require, to the exclusion of others; it is difficult to assign any other reason for this well-known arrangement, except that nature has prepared a special place for each of these substances, and has assigned them certain determinate functions in the formation of the vegetable tissues.

These reflections conduct us to the conclusion that a great number of the earthy and alkaline substances, carried by the current of the sap into the cir-

* We very much doubt the possibility of an animal living under such circumstances; if even it could, such abnormal existence or disease (as it should be called) does not afford ground for comparison.

culation, are useful to vegetation, by giving to them their full vigour, their proper size, and their diversified properties. We do not yet pretend to be able to assign to each one of these various substances its particular function in accomplishing these important ends. It may, perchance, be shown at some future time, that certain compounds are absorbed and assimilated by plants in the state in which they exist already in the soil, or in the manure. The science of vegetable chemistry is yet far short of perfection, and holds out the most brilliant results to those possessed of the industry and skill necessary to investigate this difficult subject.

After having thus settled the first question proposed, another one arises: Do all plants make a similar consumption of the soluble materials present in the soil or have they the power of selecting those most suitable to their wants? In a word, do the different species of plants require, each one, a different nutriment?

Plants, even when grown in the same soil, do not draw up a sap exactly identical. Saussure has proved in the most positive manner that the roots have the power of selection, though his experiments on the unequal absorption of different salts are not quite satisfactory: for instance, sulphate of copper, though soon causing the death of the plant, is absorbed in as large quantities as any of those compounds which are beneficial to vegetation. Saussure explains this anomaly by showing that, in the case of the sulphate of copper, the roots were decomposed, and consequently, except at the commencement of the experiment, only acted mechanically. It was well ascertained that the substances present in any solution were absorbed in very different proportions where their substances were not, like the sulphate of copper, positively injurious: for instance, *Bidens* (bur-marygold?) and *Polygonum* (buckwheat?) absorbed the salts in the following proportions:—

	Bidens.	Polygonum.
Chloride potassium	16	14.7
Cloride sodium	15	13.0
Nitrate of lime	8	4.0
Sulphate of soda	10	14.4
Muriate of ammonia	17	12.0
Acetate of lime	8	8.0
Sulphate of copper	48	47.0
Gum	32	9.0
Sugar	8	29.0
Humus (*extrait de terreau*)	6	5.0

These experiments were repeated with the greatest care; and it was proved: 1st, That plants absorbed all mineral substances when dissolved in water; 2d, That they were absorbed in very different proportions, according to the plant experimented on: this absorption was also quite irrespective of the fluidity of the solution; and, 3d, That organic matter, when dissolved in water, is not in that shape absorbed by the roots, but decomposed by their influence, and then partially absorbed.

1. Without entering into the minute details of the experiments, the absorption of the following substances was proved: prussiate of potash, chloride of sodium, sulphate of copper. acetate of lead, chloride of barium, ioduret of potassium, and many others. The absorption of nitrate of silver, corrosive sublimate, and gallic acid, did not take place until after the death of that portion of the plant plunged into their solution.

2. When the plants were placed in a solution containing two salts in equal proportions, it was satisfactorily ascertained that they were absorbed in different proportions. Even when the salts were present in different proportions, this elective absorption was not deranged. In a solution containing three

times as much common salt as nitre, a plant of *Chenopodium viride* (Goose-foot) absorbed much more nitre than common salt; whilst the contrary took place with *Solanum lycopersicum* (Nightshade). Other plants selected also common salt, and the *Tamarix* chose only sulphate of magnesia.

3. It was also ascertained that, when a plant was placed in a solution of fermenting manure, the disagreeable smell, which had been previously emitted, gradually disappeared.

If these experiments have not quite settled the question, they have at least strengthened the opinion that plants appropriate to themselves soluble substances in very different proportions. Chemical analysis of different plants grown on the same soil, also completely establishes this proposition. With regard to the oxygen, carbon, hydrogen, and nitrogen, chemical analysis has also proved that they are present in plants in proportions varying with the species, but agreeing very closely in the same plant. Analysis has also most clearly established the great diversity of the proportions in which different plants assimilate the alkaline earths. For example, some plants will be found to contain common salt in large quantities, whilst wheat grown on the same soil will contain none. Other plants again, as the wall pellitory, the nettle, and borage, will be found to contain nitrates in large quantities, though they may be grown alongside of plants containing none at all. It seems therefore impossible to avoid the conclusion that plants possess the property of choosing, or at least of retaining certain substances in preference to others, and, consequently, that different plants require different food.

But this opinion does not rest on the authority of chemical analysis alone, it is confirmed by the experience of agriculturists. For instance, it is known that certain manures seem especially to favor the growth of certain plants, as gypsum for clover; that certain plants only thrive on soils where they can obtain an abundant supply of a special ingredient, as the fern and the chestnut, on soils rich in potash, or such as are derived from slate rocks, and those of volcanic origin; that a mixed husbandry is the most productive; that a plantation containing a variety of trees produces more wood than if one species alone had been planted. These multiplied facts prove that it is not a certain quantity of a nutritive principle, but a choice amongst several, that is necessary to vegetation.

3*d*. *Researches respecting the Food most suitable to different Plants.*

The difficulties which we encounter in attempting to settle the general question become still more serious as the attempt is made to descend from general to particular cases.

It is rarely that an opportunity occurs which enables us to decide upon the effect of such or such a manure upon plants. To do this with certainty, the substances tried must be in a state of chemical purity; and as plants are composed of a great number of different substances, it would also be necessary to try each one of these separately, and to observe the effect of their application, and of the want of them; an admirable subject for the study of those who are ambitious to establish on sure grounds the principles of scientific agriculture. The long and difficult experiments necessary for this purpose have as yet hardly been commenced, and our knowledge of this important subject is as yet merely empirical. But the information we already possess must not be despised because it has not as yet arrived at the perfect solution of the question, especially as the benefit of certain mixed manures to certain plants is well known. In addition to the examples quoted in a former part of this paper, the benefit of lime to cereals, and of the sulphates to leguminous and cruciferous plants, is well known. But the very limited number

of instances we can quote, is a significant proof of the state of our knowledge. The most of the manures used contain a great number of the elements of vegetation, and it is difficult to distinguish what each plant carries off, and what is left for future crops.

In the meantime, until the experimental application of different manures shall have pointed out what is most suitable to the plant we wish to cultivate, we have no other guide than chemical analysis, or examination of the quantity of nitrogen, carbon, and mineral matter present in the ashes of the plant. Such an analysis shows us the substances which a plant has absorbed. But it is only after having submitted the growing vegetable to an experimental test, that the effect of these various nutritive matters, and the theory of vegetable food, can be established on a sett ed basis. When we shall have arrived at results from the combination of these two methods, first ascertaining by *analysis* the materials which enter into the composition of plants, then by *synthesis* offering these materials, and thus satisfactorily ascertaining their individual effect, the science will then be perfect.—*London Farmer's Magazine.*

CONSUMPTION OF GUANO IN GREAT BRITAIN.

THE following statistics of Guano imported into the British islands will probably have interest for those of our agricultural readers who are in the habit of exporting all their produce to be consumed at a distance, thus impoverishing their land and exhausting their capital, when it needs but a brief effort to bring the consumer to their sides, making a market on the land for all its products, and enabling them to return to it the manure, augmenting instead of decreasing its productive power :—

In 1841 the total quantity imported into the United Kingdom was 2,881 tons from Peru and Bolivia; in 1845, owing to the discovery of supplies on the coast of Africa, it rose to its highest point, namely 283,300 tons, of which Peru and Bolivia contributed only 14,101; and in 1848, the African supply having almost entirely ceased, it had declined to 81,414, nearly the whole of which was from Peru. Since then the total has again increased, the quantity having been 83,438 tons in 1843, and 116,925 (of which 95,083 were from Peru, and 5,587 from Bolivia) in 1850. During the past year various minor shipments have been received from the Azores, Mexico, Brazil, and Buenos Ayres, and at the same time those from Africa, Chili, and Patagonia, have all partially recovered. The increasing demand is evidently occasioning renewed inquiry as to the resources of other countries with regard to this material. The extent of the newly-found deposits at Shark's Bay, Swan River, remains yet to be ascertained, but the accounts regarding them have thus far been promising, both as regards quantity and quality.

MANGOLD WURZEL AND SALT.—My crop of Mangold Wurzel, in the autumn of 1843, was magnificent; more especially on two thirds of the field which adjoined a small coppice-wood, which, having been cut during the previous winter, gave life and vigor to all the weeds that had been kept under during the previous ten years. And this part of the field was, consequently, covered with common groundsel, which, during the wet spring and fine summer, sprang up and flourished surpassingly thick, covering every space between the drills. I ordered my old friend and assistant, common salt, to be strewed over the groundsel and between the drills, following the hoes, which were at work upon this weed. The result was, their total destruction. The quantity of salt applied was much more than I intended, and I apprehended injury to the wurzel; they were, however, far advanced in size. But, so far from suffering, they increased immensely. The crop—upwards of 100 tons. [How did you ascertain this?] The field is 1¾ of an acre. Wheat followed—an excellent crop. Then turnips after ploughing; which are, at this moment, flourishing—for sheep by-and-by. From the moment the turnips came up, the part of the field salted has been most conspicuously superior to that not salted; so much so as to be visible from the opposite side of the valley.—*Waterhouse, near Bath.*

ENGLAND'S FREE TRADE PROFESSIONS AND PRACTICE.

THE London *Nautical Standard*, says the *Republic*, in an article devoted to the World's Exhibition, indulges in a strain of comment on the free trade professions and policy of England that it may be possible for some of our friends to profit by. The *Standard*, after stating the total number of exhibitors from foreign countries at 9,743, of which France sends rather more than one third of the whole, proceeds to say:—

"These figures must give to Englishmen much to think, and to reflect. But a few years ago Belgium could hardly be considered as a manufacturing country, and this year she sends to Hyde Park the large amount of 1,050 specimens of her own productions. France, in 1815, had but few and unimportant manufactures, and in 1851 she presents the high number of 3,329 samples of her commerce. Prussia is represented by 1,072 articles of her own fabrics, and many States, which a few years ago were represented as our customers, have become manufacturers and concurrents with us in many foreign as well as in our own markets. We are afraid that the progress made by many of the nations we have named is owing to the blind policy England has followed for so many years: by imposing many and heavy taxes on the productions of other countries, *we have caused them to impose the very same duties on our own, and in self defense they have been obliged to become producers instead of buyers of goods.* We quarrel with other countries for imposing duties on our goods, and in the same breath we mulct their productions to the utmost. We grumble at the French for laying a duty on our sea-borne coal, and we lay a tax of three or four times its market value on their brandy. We ask Government to interfere with the ministers of the United States on account of their protective tariff, and we put and receive a duty of something like eight hundred or nine hundred per cent. on their tobacco. *In fact, we insist on our goods being admitted free of duty abroad, and we tax other countries' goods with the largest and most exorbitant duties. We speak about reciprocity and free trade, but we do not follow out our boast nor our principles.*"

CONCENTRATION AND VARIETY OF PURSUITS.

WE have repeatedly urged the improving effect of concentration and variety of pursuits on all the arts of useful and productive industry. In a late number it was said, that he who wishes to see and enjoy fruit and flowers in the greatest variety and excellence to be met with in the United States, must turn his face to the bleak North, and wend his way to the rocky and snow-clad regions of Connecticut, Rhode Island, and Massachusetts, where he will see, as he travels cheaply and swiftly in all directions, what would seem to be a desperate, impracticable compound of stone and sand. Nevertheless, it is there where the loom and the anvil are found in social proximity to the plough and the harrow; there he will see the plough and the spade rewarded with the heaviest crops. A practical knowledge and familiarity with the arts of horticulture and floriculture is not there the exception, but the rule. As men of various occupations approach each other and *combine* their knowledge and their labors, refinement ensues in the practice of all the arts; the coarser and simpler occupations, as the growing of grain, and cattle, and sheep, and horses, are relinquished and pushed farther off, to be followed by men who live to exhaust in their culture more distant lands, and to live in ignorance of and abstinence from fruits and flowers, making shift to get along as well as men can do who live apart from each other, and who, having no market at hand, have no encouragement to cultivate the luscious pear and the harvest plum; the purple grape, the tulip, the carnation, and the japonica. From all these exquisite enjoyments are men precluded when nobody is near to consume the products of the land. In Massachusetts not only is every imaginable pursuit followed with activity, so near to each other as to afford

mutually a market and a support, but they have provided, in all directions, the best possible roads of stone and of iron; so that over any given distance the shortest possible time is consumed in the work of exchange of product for product. They seem *in this* to have thoroughly put in practice the *great spring* to improvement in every art. Yes, this is the only road to certain and progressive improvement, and reward to labor and capital; and the policy hat promotes it is *the one* in which the landholder above all men is most deeply interested. If any one doubts the practical effect of success in the growth of fruits and flowers, and how invariably it denotes not only high social and intellectual refinement, but increased value in lands, let him inquire, and see if he does not always find lands rising in value as they are connected with or form the localities where fruits and flowers are most generally cultivated, and in greatest excellence and variety.

THE WAY THE FARMERS PAY FOR IRON.

We learn from the Pittsburg papers, that D. Kilgore, Esq., President of the Steubenville and Indiana Railroad Company, is now in that city superintending the engraving and printing of the Company's bonds, which are nearly ready for execution. These bonds are on the city of Steubenville, and the various townships in Jefferson, Harrison, Carroll, Coshocton, and Tuscarawas counties, Ohio, which voted in favor of subscriptions to the Railroad. They are of the denomination of $1000, bearing seven per cent. interest, payable at the office of the Ohio Life Insurance and Trust Company in the city of New York. The amount subscribed is about $1,000,000, which, it is supposed, will be sufficient to build the road from the Ohio River to Coshocton. An effort will be made to push this road east from Steubenville to Pittsburg, a distance of about forty miles, so as to connect with the Pennsylvania road at that point. There is a charter in existence for this route, and the estimated cost is between $800,000 and $900,000. If this link were completed, it would successfully compete with any other road for the trade of Southern Ohio.

We take the above from one of our exchange papers, with a view to call the attention of our agricultural readers to the similarity of the course of things at the present time, and in the "prosperons" years 1836, '7, '8 and '9. At that time the States of Indiana and Illinois issued bonds to the amount of many millions of dollars, and thus created a debt under which they have been struggling from that time to the present hour. Now it is the counties of Jefferson, Harrison, Carroll, &c. &c., that issue their bonds, and the disposition that is made of them will be seen by the following paragraph, which we take from the *Pittsburgh Journal*:—

The British iron bought by the Ohio and Pennsylvania Railroad Company, 8,000 tons, cost $34 per ton, laid down on the landings at Quebec and New-Orleans.

The American iron bought by the same company, 3,000 tons, cost $52½ per ton, laid down in Allegheny City, or at Beaver.

The recent contract with the same parties, for 2,500 tons more of American iron, is at $48 per ton. If the clear saving on the 8,000 tons British iron were no more than $5 per ton, it would be a total of $40,000 saved to the stockholders of the Ohio and Pennsylvania Company, by the purchase of British iron.

The people of Ohio, whose farms are underlaid with coal and iron ore, unite to give bonds—that is to say, to mortgage their farms—for the purchase of British food in the form of iron, believing it more profitable to them to employ British laborers in Great Britain, than to offer them inducements to come here and eat their food while employed in making their iron. The British laborer, at home, may perhaps consume one, two, three, or five pounds of their food in

the course of the year, whereas, once here, the whole product of his labor would go to the purchase of food for himself and his family—to the payment of those employed in raising the cotton and the wool, and in converting them into cloth for the use of his family—and to the payment of the men who were employed in furnishing them with house accommodation, &c. &c.; and each and every one of the men thus employed in his service, would be a customer to the farmer for food. The market to the American farmer afforded by a single ton of American iron, is greater than that afforded by twenty tons of British iron; and yet our farmers are busily employed in closing our furnaces and compelling miners and furnace men to become farmers, while mortgaging their farms for the purchase of British food in the form of iron. The effect of this is already visible in the low price of grain, and should the anticipation with regard to the crops in Europe and in this country be fully realized, the day would seem to be not far distant, when our farmers will experience in its fullest extent the *benefits* of the tariff of 1846, in closing *a large and rapidly growing market at home*, for the purpose of securing *a small and rapidly decreasing market abroad.*

FARMERS AND MECHANICS WANTED.

We have long been of opinion that no part of the United States offered greater advantages to the laboring population than the Lake Superior region. The climate, though cold in the winter season, is remarkably healthy, proving a sure remedy for the fevers and consumptive complaints of warmer latitudes.

The soil of large portions of the country is equal to any in the Western States, and yields large crops of the best potatoes, turnips, hay, oats, &c. The district about the Ontonagon river, especially, consists of excellent farming lands, and the copper mines now in prosperous operation in the same vicinity insure a home market for large quantities of agricultural products. We know of no section we can so heartily recommend to the attention of farmers as this. Potatoes, which can be raised for 15 to 20 cents a bushel, bring in the fall 62½ to 75 cents, and other crops at similar proportionate advances, while the demand continues so much greater than the supply, that large quantities of roots and grains, such as are raised about the mines, are still transported from Detroit, a distance of seven hundred miles.

All kinds of labor are in great demand, and at prices far above what is paid below, in consequence of want of men. None go to the upper country but they easily find employment, and good, sober men secure permanent work at such wages as they have never received in the older settled portions of the States. To all industrious men, seeking employment, we recommend the mining region of Lake Superior. Here, if so disposed, their wages may be invested in lands, the increase in value of which will cause their profits rapidly to accumulate.—*Lake Superior Journal.*

Can Grapes be profitably cultivated in Pots?—I had a few eyes of Hamburgh and Welbeck Black Tripoli, which I put into pots in the first week of March, 1849; they rooted in three weeks, and were potted off singly. At the end of 28 days, when they had made four leaves, they were pinched off at the top, the lateral that was afterwards produced, forming the fruiting plant. The 12 plants were kept in a strong moist heat of from 70° to 90°; they were twice shifted during their summer growth, and by the end of September they had each made 17 feet of wood. They were then removed to a south wall; very little water was given them, and on the 1st of January, 1850, they were put into a pit heated by hot water. They broke regularly from the pot to the top of the plant, many of the eyes showing two bunches of fruit, and some of the plants had 30 bunches on them, but these were reduced to 7 bunches to each plant. They ripened perfectly, and I commenced cutting on the 12th of May. When the fruit was removed, the plants were liberally suppliod with strong manure-water, and they are now in a fair way to bear a good crop next season.

GEORGIA—HER STATISTICS AND PROSPECTS.

The lead which Georgia is taking of all the Southern States should be a lesson to her neighbors to build up factories along with her railroads. Each helps the other. To attempt to build railroads, when there are no products of domestic industry to secure them profitable employment, is to put the cart before the horse.

The population of the city of Augusta, Georgia, is ascertained to be: whites, 7,138, slaves, 4,742, free colored persons, 224—total, 12,104. The total population in 1845 was 7,502. The increase in five years, therefore, has been 4,602, or a fraction over 61 per cent. Upon this remarkable increase, which the *Chronicle and Sentinel* says has been mostly within the last two years, that paper remarks:—

> This is a very fair demonstration of the influence of manufactures upon the growth and prosperity of cities, which will apply with much justice to the country. Let Georgians and Southern men, as they would merit the character of patriots, statesmen and philanthropists, ponder on these facts, and persevere in the great work of enriching the South, improving the condition of the people, and rendering her independent.
>
> All this may be accomplished by building up manufactories in every neighborhood, village, town and city throughout the South, which will give the wives and children of the poorer classes employment, and convert them into producers. Now the great mass of them are merely consumers, adding little to the wealth of the country; create a demand for their labor, which they have to sell, and they become at once wealth-producers, enriching themselves and adding greatly to the wealth of the country.

POULTRY MANAGEMENT.

I have always considered the rearing and management of poultry a matter of much more importance to the farmer than he is generally willing to believe. My poultry are of the same sort as may be found in any of the neighboring farm-yards; the eggs of the largest and best hens have been selected for sitting, so that the stock consists of birds capable of covering 15 eggs, which is the largest number I ever place under a hen. The cocks are changed every two years, taking care to supply their place with fine healthy birds of the previous year. Hens are useless after the third year; my plan is, in a stock of say 30 hens, to introduce 10 young pullets every year, and part with 10 of the oldest hens. One male bird must be kept to every seven hens; but when more than 50 hens are kept, one to every six is necessary. On the proportion of male birds kept depends, I am confident, the number as well as the successful fecundation of the eggs. About a month since, as an experiment, I placed 13 eggs, which I had procured from a farm-yard where the proportion of male to female birds is about 1 to 15, under a hen: and mark the result. From 13 eggs were produced three chickens; seven of the eggs, at the end of the three weeks, were almost as fresh as when just laid, and three were addled. My chickens are fed twice a day, in the morning about half-past 7, (later of course in winter,) and at 2 in the afternoon. Their food consists, during the five summer months, of dry barley, and from October till April of boiled barley given warm, and 20 oz. per day each of tallow-cake or chandlers' greaves, (the same as used by Mr. Huxtable for his pigs;) the cost of this latter is a fraction under a penny per lb., and is, I think, the best and cheapest substitute for the animal food they are unable to procure in the form of flies and insects, at that season. I have found by experiment that fowls will lay more regularly on barley than on any other grain. Hens during the period of incubation should be fed on dry barley, as the greater the heat maintained in the body of the hens, the finer and more numerous will be the progeny. Never turn the eggs, as some do; the hen will do this herself. Leave the chickens till nestled, *i. e.*, till the down becomes dry; feed them with soaked bread for the first two days, returning them as soon as fed to the mother, after which they may be kept on tail wheat, (and curds, if you have the milk,) until they are seven or eight weeks old,

when, and not till when, they may be fed on barley and barley-meal mixed with bran or pollard. I have this year only 18 hens and three cocks, the foxes having stolen rather more than one third of my stock during the winter; these 21 fowls consume a sack of barley, which costs now 11*s.*, in 31 days, and have laid on an average 16 eggs per day since the 1st of March. I find the expenditure for corn, tallow-cake, &c., for the old stock (not for the chickens produced by them) pretty nearly balanced by the receipts from the eggs one time with another. The following is the account, Dr. and Cr., of a stock of eight hens and one cock kept by myself, in an enclosed yard, during the year 1849.

DEBTOR.

	£	*s.*	*d.*
Eggs sold—number unknown, but furnished all food consumed by the nine fowls mentioned,	0	0	0
Chickens reared—33 couple, sold at 3*s.* 3*d.*,	5	7	3
12½ couple, reserved for stock for present year, at 3*s.*,	2	0	6
3½ couple of ducks, at 2*s.* 9*d.*,	0	9	7½
	£7	17	4½

CREDITOR.

1 sack of barley consumed by young chickens,	£0	15	6	
1 strike of barley for do., and grinding,	0	4	4	
1 cwt. bran,	0	5	0	
6 pecks tail wheat,	0	6	0	
Marketing expenses,	0	6	1	1 16 11
				£6 0 5½

£6 0*s.* 5½*d.*, divided by 8, the number of hens, gives a net profit of rather more than 15*s.* for each hen.—*The Son of a Country Rector.*

MINERAL INGREDIENTS PER ACRE OF AVERAGE AGRICULTURAL CROPS.

	Potash at 4*d.* per lb.			Salt, 2*d.* per stone.		Lime, 6*d.* per bushel.		Gypsum, ½*d.* per lb.			Bones, ½*d.* per lb.			Total.	
	lbs.	*s.*	*d.*	lbs.	*d.*	bshl.	*d.*	lbs.	*s.*	*d.*	lbs.	*s.*	*d.*	*s.*	*d.*
Wheat,	6	2	0	14	2	1	6	6	0	2	34	1	5	4	3
Barley,	14	4	8	17	2½	1	6	12	0	4	48	2	0	7	8½
Oats,	42	14	0	7	1	1	6	9	0	3	8	0	4	15	2
Rye,	9	3	0	10	1¼	1	6	16	0	5¼	13	0	6½	4	7
Bean	88	27	8	44	6¼	1½	9	8	0	3	70	2	11	52	1
Peas,	28½	9	6	36	5	2	12	32	0	11	60	2	6	14	4
Swedes,	106	35	4	100	14	1½	9	70	1	11	66	2	9	41	11

If the analysis be correct, and the foregoing hypotheses also based on proper principles, it follows that wheat can be grown at less expense per acre than any other crop; and it may be equally deduced that it is less exhausting to the land. It also follows that such land as contains the greatest portion of potash and phosphoric acid can be cultivated the most economically.—*On the Possibility of growing Wheat successively on the same Land, by H. Briggs, Wakefield.*

ENGLISH AGRICULTURAL DINNERS AND SPEECHES.—A writer in a late English Agricultural paper says: "We should have been glad to have heard from one from the further hemisphere the words he would have uttered; we mean Colonel Morris, of New-York. But the rules of the Society silenced him, though the meeting called upon him by name. Mr. Rives, of Virginia, we would also gladly have heard. Virginia, so associated with our own great countryman Raleigh, so wise, so learned! The axe and the veto of a chairman can cut short instruction. However, in excuse it may be supposed the American guests might argue the question of free trade, and so put the meeting in hot water. At these meetings much information is obtained from men who attend from various countries. It is to be hoped Devonshire will improve after this visit of the Society. Cream and apples are very good things, but good farming far better."

HOLLYHOCKS.

If I were not afraid of advancing a horticultural heresy, I should say that many amateurs prefer hollyhocks to dahlias. The hollyhocks of Belgium and Germany had a great celebrity long before they appeared among us. The collections of the Prince of Salm Dyck, and M. Van Houtte, of Ghent, have been much admired. In other places varieties have been obtained with leaves more or less lobed, more or less entire, more or less palmate, all with flowers large, full or colored differently from those of other plants, being sometimes of a more or less dark mahogany color, at others of a delicate tint, and varying from the purest white to the darkest glossy black. Some progress has also been made in the cultivation of those plants by ourselves. Since 1830, M. Pelissier, Jr., a gentleman of Prado, has cultivated hollyhocks, and from the seeds of a pink variety has succeeded in obtaining plants with flowers of a delicate rose color, and which, in consequence of the extreme delicacy of their tints, and regularity of form, may serve both to encourage perseverance and as a good type for seed. In the following year, from the seeds of pink flowers, he obtained a beautiful, brilliant, clear, sulphur-colored specimen, perfect in every respect. It is from the seeds of those two plants that he has obtained all the other beautiful and remarkable varieties which he now possesses, after a lapse of ten years from his first attempts. As a general rule, M. Pelissier prefers flowers with six exterior petals, with entire edges, well open, well set out, of a middling size, of a pure, clean, brilliant color, and forming a perfect anemone. Seeds sown in the spring and in unwatered ground never flower till the second year. Experience has shown that if the seeds are sown in September, and in earth which is kept fresh, flowers may be obtained in June or July following, which are in no way inferior to those of spring-sown seeds. M. Pelissier follows the following plan of procedure: The seeds, which are taken as soon as they are ripe, from good specimens, are sown in September, in a border a foot and a half deep, and composed of good coarsely sifted garden earth, mixed with well-worked soil. The seeds, if they are covered lightly with leaf-mould, and the soil is kept fresh, begin to swell at the end of the week; they require little care till spring, as they are not hurt by frost. In the spring the ground must be repricked, occasionally hoed, and frequently watered. As the flowers expand, M. Pelissier removes whatever is not conformable to the type he has chosen, or is not of a marked color, and like a perfect anemone. It is by doing this every year that he has obtained twenty remarkable varieties.

We wish we could see more attention paid to the cultivation of this magnificent flower—only neglected because not very new, nor difficult to be had.

CHEAP LABOR.

It was recently stated, in a mercantile paper, that in Massachusetts, the great staples of agriculture—cereal grains—beef and pork, &c., had diminished, as appears by the census, with the growth of manufactures; and an argument was thereon predicated, or rather a conclusion jumped at, that therefore manufactures were thriving at the expense of agriculture. Now nothing could well be more fallacious than such an inference. So far from it, it comes in direct corroboration of what we have ever contended for in the *Plough, the Loom, and the Anvil;* in fact, it illustrates the main purpose for which this work was established, for it proves that when the manufacturer sits down by the side of the agriculturist, when the loom and the anvil take their place by the side of the plough, then it is that men give up making corn and wheat, and rye, and oats, and things that are measured in bushels and sent off to be consumed at a distance, and go to making potatoes and turnips, and cabbages, and milk, and butter, and fruit, and onions, and carrots, that may, *on the spot,* be sold and exchanged for manure, or consumed on the spot and converted into milk and butter; the refuse of the land being in all

cases returned to the land; its ammonia, its phosphates, and all its elements of fertility which grain crops carry off and which bullocks carry off in their meat and bones to a distant market, is thus reserved and restored to the mother that bore them.

DAIRY MANAGEMENT.

"A Flintshire Dairyman," amongst other questions of much importance to dairymen, which, I doubt not, will be readily answered by a more practical man than myself, asks how far the system of house-feeding is applicable to dairy management, particularly the manufacture of cheese? I would refer your correspondent to Professor Playfair's lecture in the 4th volume of the Royal Agricultural Society's "Transactions," where he will find that whilst house-feeding of cows is admirably suited for promoting a great increase of butter, if the animals are properly fed, grass-feeding, or out-of-door feeding, is essentially necessary for the manufacture of cheese. And this reason is assigned for the difference in treatment: that a generous diet and warmth and quiet are promotive of the oily substance of the milk, from which butter is made; but that exercise, and less rich nourishment, produce that peculiar substance in milk called casein, from which cheese is procured. In fact, it appears that, without exercise, very little casein is obtained from the cow, and that the waste of the tissues which exercise promotes, increases indirectly the amount of casein in the milk. It is, however, a matter of very great importance to the cheese farmers to ascertain whether, by feeding the cows more frequently with leguminous food, which contains a larger proportion of casein than other vegetable food, and giving them regular exercise, as your correspondent suggests, the advantages of house-feeding, which are in many ways of essential benefit, cannot be practised by the dairyman in the manufacture of cheese. The economy of food, the collection of manure both solid and fluid, the general comfort of the animals, the increased number of cows which can be fed on the same land, the facility of milking, &c., all combine to render the house-feeding of cows most desirable; and I hope some experiments will be made with this object in view. As exercise increases the casein in milk, a cow-house could be so constructed that there should be a circular covered walk, where the animals could be daily exercised; or could they not be trained to the yoke, and accustomed to draw light weights? (the manure, for instance, out of the yard.) Of course, great care would be required that they should not strain themselves, but merely exercise their muscles. I have seen in Flanders the ploughing of land by cows, but I should consider this much harder labor than is proper.—*An Old Subscriber.*

Flax-seed as Food.—Will you allow me to communicate to the readers of your valuable paper the result of my little experience in the use of Flax-seed for feeding a saddle-horse. I was induced, from reading Mr. Sproule's articles in the *Gazette*, on Flax, and Warnes's System, &c., for farm-horses, to try the experiment with my saddle-horse, which has now been fed 12 weeks upon the following diet, and is in excellent condition, with a good coat, notwithstanding the severe weather to which it has been a good deal exposed; for, being a surgeon, I am obliged to leave it standing at the doors of my patients continually:—

6 stone (of 20 lbs.) of wheat-straw, at 6*d.*,	3*s.*	0*d.*
½ stone good hay, at 13*d.*,	0	6¼
½ score bran,	0	6
7 lbs. ground linseed, at 3*d.*,	1	9
(Per week,)	5*s.*	9½*d.*

These are retail prices, and include straw for bedding, which, however, is economized by being put up under the manger during the day-time. Upon this my horse has, of course, done easy work; it has, however, only been four days in the stable, and has averaged 8 miles a day for the last 12 weeks. I have also a drawback on the manure, which, at the price here, will I think reduce the cost of keep to 5*s.* a week. I should state that my apparatus is neither extensive nor expensive. I boil in a five-quart pan a gallon of water, with ½ lb. of good linseed and a little salt, a common butter-firkin

being filled with the chaff (straw and hay) mixed with the proportion of bran; the boiling linseed is poured over it, and well mixed with a broomstick, more chaff being added as it settles, after standing an hour or two; this is given at night, and a second supply (the operation being repeated with a little more chaff) stands all night, and affords the animal as much as she can eat the whole of the next day; the salt increases her relish.—*J. B. N., Liverpool.*

Wash for Fruit Trees.—I am, at this season of the year, frequently asked what is the best wash for fruit trees, both trunk and limbs. The following has given me the best satisfaction of all the various mixtures I have tried, and I have used no other for at least 12 years:—I use a large vessel, say a tub, made by sawing a molasses-hogshead in two, at the bung, which will hold about 70 gallons; in this tub I put a wheelbarrow load of yellow clay, and an equal quantity of fresh cow-manure, covering it with water. After soaking and mixing a day or two, I add half a bushel wood-ashes, 1 lb. of sulphur, 6 or 8 lbs. of soft soap, and mix well together; then slake half a peck of lime, and add to the above, using water sufficient to make the whole about the consistency of thin cream, which will nearly fill the tub; mix well together for several days; then, with a common whitewash-brush (an old floor-brush will answer) I paint the bodies of the trees, having first used a smaller brush to paint the crotches of the limbs, and the limbs themselves, as far as possible. I think any gentleman trying this wash, or paint, if you please, will find it to give him perfect satisfaction on every kind of fruit tree in ordinary cultivation with us.—*Captain Lovett, in Hovey's Magazine of Horticulture.*

Manure for Grass Land.—I was anxious to know what quantity of grass could be procured by stimulating manures, by experiment. This experiment has been made on 100 superficial yards of grass land; and by manuring after every crop, I have mowed five times, and have had each time as much grass on the land as what there usually is when persons mow for hay. The manures I made use of were pounded charcoal, malt-dust, muriate of ammonia, sulphate of magnesia, and nitrate of soda. The salts were put on in a liquid state, 2 oz. to each yard. I mowed the fifth time on the 10th of August. The land is by no means good land on which this experiment was made, and which is not yet completed. These manures will give to very poor land the appearance of very good land, as long as their effects last.—*C. A. A. Lloyd, Whittington Oswestry.*

Pickling of Meat.—Professor Refinesque denounces the use of saltpetre in brine, intended for the preservation of flesh to be kept for food. That part of the saltpetre which is absorbed in meat, is nitric acid, or aquafortis—a deadly poison. Animal flesh, previous to the addition of pickle, consists of gelatinous and fibrous substances, the former only possessing a nutritious virtue; this gelatine is destroyed by the chemical action of salt and saltpetre, and, as the Professor remarks, the meat becomes as different a substance from what it should be, as leather is from the raw hide before it is subjected to the process of tanning. He ascribes to the pernicious effects of the chemical change all the diseases which are common to mariners and others who subsist principally upon salted meat, such as scurvy, sore gums, decayed teeth, ulcers, &c., and advises a total abandonment of the use of saltpetre in the making of pickle for beef, pork, &c., the best substitute for which is, he says, sugar, a small quantity rendering the meat sweeter, more wholesome, and equally as durable.—*Bath.*

NEW BOOKS.

The Year Book of Facts in Science and Art; exhibiting the most Important Discoveries and Improvements of the past year. One vol., pp. 328. Philadelphia: A. Hart, late Carey & Hart.

In the present age of improvement, when every day brings out some new discovery in science and art, such a book as the one before us cannot but prove not only vastly interesting, but almost necessary to enable us to keep up with the progress of the age. Looking into this volume the reader will be surprised at the many "new things" a single year has brought out.

FATTENING CATTLE.

A DISSERTATION ON THE PHILOSOPHY OF FATTENING CATTLE...PART II.

Much discussion has arisen between Mons. Dumas and Baron Liebig respecting the formation of fat; the French philosopher maintains that the vegetable which is partaken as food by the animal, possesses, already formed in its structure, all the fat which is absolutely essential for the animal; and that, like the gluten which is necessary for the formation of muscular or fleshy fibre, the phosphate of lime for the bones, and the starch or gum for the formation of animal heat, the fat which is contained in the vegetable is destined to supply the fat in the animal body.

On the contrary, Baron Liebig contends that if the animal is properly supplied with a greater quantity of the non-nitrogenous constituents of the food—viz. the sugar, starch, and gum, than are necessary for the proper supply of the demands in the animal heat, they become converted into fat in the animal economy. I am inclined to support the hypothesis of Mons. Dumas; for, in my humble opinion, I think it both simple and beautiful; and, if we take into our consideration the animal in its primitive and original state, I conceive the accuracy of the theory cannot for a moment be questioned. But we must remember that the great quantity of fat we see accumulating in those oxen, sheep, and other animals, which we keep confined in our stalls, originates from an abnormal condition of the system, and is produced by the circumstances under which the animal is placed; and as such, in addition to the fat already formed in the vegetable, the animal possesses the power of secreting an additional portion of fat from the food which it consumes. The earthy and saline substances which are contained in the crops themselves have very important duties to perform in the animal body; thus, for example, they afford a supply of phosphate of lime for the due formation of bones, as well as the saline particles which are constantly present in the blood, flesh, softer tissues, and secreted fluids of animals. How far the ordinary cultivated crops are capable of properly answering the functions thus required of them, you will see on referring to the following Table:

TABLE III.

ON THE AVERAGE COMPOSITION OF CROPS.

100 Parts.	Water.	Woody Fibre.	Starch, Gum, or Sugar.	Gluten and Albumen.	Fatty Matter.	Saline Matter.
Wheat contain of.....	16	15	55	10 to 15	2 to 4	2·0
Barley	15	15	60	12	2·5	2·0
Oats	16	20	50	14	5·6	3·5
Beans	16	10	40	28	2	3
Peas	13	8	50	24	3	2·8
Potatoes	75	5	12	2	0·3	1
Turnips	85	3	10	1	?	1
Carrots	85	3	10	2	0·4	1
Meadow Hay	14	30	40	7	2 to 5	5 to 10
Clover Hay	14	25	40	9	3	9
Pea Straw	12	25	45	12	1 8	5
Oat Straw	12	45	35	1·3	0·8	6
Wheat Straw	14	50	30	1·3	0·5	5
Barley Straw	14	50	30	1·3	0·8	5
Buckwheat	18	18	45	10	2·6	2·3
Maize	13	16	51	10	5·6	2·5
Rice Dust	14	77		2	5·2	2·2
Linseed (good).....	10	27		22	36	4
Oil-Cake	15 to 20	15 to 24	30 to 50	12 to 22	5 to 14	5 to 10

You will easily perceive from this useful Table, that 100 parts of the various species of crops grown by the farmer contain very variable proportions of dry solid food; thus, in order that the animal may obtain the same equivalent of dry food as 100 lbs. of hay would produce him, he must consume not less, but probably more, than 600 lbs. of Swede turnips or carrots, or 300 lbs. of potatoes; but of this dry matter, you will please to bear in your recollection, the composition exerts a very material influence over its value as food. I have described the manner in which the gluten, casein, and albumen of the vegetable are converted into the blood, flesh, softer tissues and fluids of the animal: hence young animals which are supplied with food containing much of these muscle-forming

principles are found to grow rapidly, and their muscular frames will be duly developed: but, unless they are liberally supplied with such substances as fat, gum, and starch, by which the animal heat is formed and kept up, the animals will be muscular, but utterly unfit for the butcher's purpose. It is a very common practice to feed young growing pigs upon the refuse of the slaughter-house, in some places, such as the blood and intestines of the slaughtered animals; and in France, many hundreds of pigs are annually fed upon horse-flesh; these pigs grow rapidly, and their muscular frames are finely developed, but they do not become fat, unless they are properly supplied with a liberal portion of non-nitrogenous food, such as potatoes or meal would yield.

As it is only from the nitrogenous constituents that muscle is formed, it has been supposed that the quantities of these substances contained in any given article of food would be a fair estimate of its feeding value; and, under this supposition, Mons. Boussingault has constructed some Tables of the proportion of nitrogen contained in different vegetable substances. The late Rev. W. Rham has published in *The Journal of the Royal Agricultural Society of England*, some Tables of the relative value of different kinds of food as arrived at by practice; but all such Tables must, to a certain extent, be arbitrary, inasmuch as the quantity of these animal substances consumed by the animal must be influenced by circumstances; the animal taking active exercise requiring a much larger quantity, in order to supply the natural waste which would occur under these circumstances, than if the animal was at rest.

We have also seen that the starch, gum, and sugar of the vegetable supplies the constituents by which the heat of the animal is maintained; and as this heat never varies during health, whatever variation may occur in the temperature of the atmosphere or apartment in which they are placed, it follows that the lower the temperature, the larger will be the quantity of carbon consumed in the animal body; this increased consumption arising from a larger portion of oxygen being introduced into the body during cold weather, than when the temperature of the atmosphere approaches nearer that of the animal: hence, animals will consume a larger amount of food during the winter months than in the summer season, and those which are exposed to the chilling blasts of winter, more than those fed in sheltered situations, warmth being equivalent to a certain supply of food. With this remarkable fact before us, we cease to be surprised at the enormous quantity of train-oil and fat which is consumed by the Greenlander, while the inhabitants of the tropics exist upon fruits and light, farinaceous diet. In the former, the surrounding atmosphere is constantly robbing the body of its heat; while in the latter the temperature of the air approaches so near to that of the body that a little additional heat is sufficient to maintain the requisite temperature. Exercise, also, by increasing the number of inspirations, introduces into the body a larger amount of oxygen than would otherwise be inspired; and as this never leaves the body without undergoing a change, it follows, as a matter of course, that the greater the number of inspirations taken within a given time, the larger will be the demand for food to supply the consumption in the body. Hence we find that an increase in temperature, with diminished exercise, tends to lessen the quantity of food consumed, and also to increase the weight of the animal. This fact was clearly proved by Mr. Childers in feeding sheep. In this experiment he selected from his flock forty sheep, and divided them into two lots of twenty each; one lot was left in the field, which had a dry and sandy soil; the other lot was placed in a shed, upon a floor made of pine-planks, in order that they might be kept dry, the floor being swept once a day. The experiment commenced on the first of January, when the twenty sheep in the field weighed together 134 stones 4 lbs., while the weight of those placed in the shed was 133 stones 3 lbs.; each lot had as many turnips as they could eat, which averaged 27 stones per day; each sheep was also allowed in addition, half a pound of linseed-cake, and half a pint of barley per day, with a little hay, and unlimited supply of salt. For the first three weeks each lot consumed equal portions of food; but in the fourth week, the sheep confined in the shed ate a less quantity of turnips, by three stones per day, than those in the field; and on the first of February they had gained in weight 21 stones 11 lbs., while those in the field had only gained 15 stones 14 lbs. By the ninth week of the experiment the sheep in the shed had diminished their consumption of turnips two stones more, and also three pounds of linseed-cake per day; and on the first of March the shed-fed sheep had gained 10 stones 10 lbs. more in weight, while the sheep in the field had only gained 8 stones 8 lbs.; and at the end of the experiment, on April the 1st, the shed-fed sheep had gained in the last month 23 stones 15 lbs., or in the three months 56 stones 6 lbs., while the sheep in the field had only gained 12 stones 10 lbs. in the month, or in the three months 36 stones 8 lbs., making a difference in favor of the shed-fed sheep of nearly twenty stones; the sheep in the field consuming the same quantity of food during the whole time of the experiment. In this experiment we have convincing proof that the quantity of food required by an animal will be less in proportion to the increase of temperature; and that when a liberal diet is allowed, but without shelter, much of the constituents of the food will be consumed to keep up the heat of the animal, which would be otherwise stored up in the body as fat, if no such cause of waste existed; and hence to the influence of cold is to be attributed the

difficulty of fattening animals in cold weather, or in bleak, unsheltered situations.

I may here state to you some experiments which were made by that truly philosophical agriculturist, Mr. Morton, at Earl Ducie's farm, at Whitfield, as illustrative of the effects of an increase of temperature and diminished exercise upon the feeding of sheep. In the first experiment five sheep were fed in the open air, between the 21st of November and the 1st of December; they consumed 90 lbs. of food per day, the mean temperature of the atmosphere being 44° of Fahrenheit's thermometer; at the end of this time they weighed 2 lbs. less than they did on the 21st of November. In the second experiment, five sheep were placed under a shed and allowed free motion, the mean temperature being 49°; they consumed at first 82 lbs. of food per day, then 70 lbs.; at the end of the experiment they had gained in weight 23 lbs. In the third experiment, five sheep were placed in the same shed, but were not allowed to take exercise; they ate at first 64 lbs. of food a day, then 58 lbs., and increased in weight 30 lbs.

Darkness, in combination with rest and warmth, tends mutually to facilitate the fattening process, by removing those causes of excitement which might otherwise exist, and which would tend to an increased consumption of carbon or fat-forming principle in the lungs. It is well known to the practical farmer, that restless animals consume a larger quantity of food, and fatten much slower, than those of a quiet disposition; and as it is the object of the feeder to produce the largest weight of flesh with the smallest quantity of food, all those collateral circumstances should be attended to which will facilitate the attainment of the desired object.

Another important point to be properly attended to in the management of cattle is the regularity of their feeding; inasmuch as the gastric juice is secreted by the glands of the stomach at the accustomed time of feeding; and therefore, if there is no food for it to act upon, it irritates the coats of the stomach itself, producing a degree of inquietude and restlessness which is highly injurious, and tends to check that steady progress of the animal which it is so desirable to maintain. M. Von Thaër, in his work on "The Philosophy of Agriculture," informs us that, in fattening, care should be taken to maintain a uniform and, particularly in winter, a somewhat high temperature Light must be intercepted; for just in proportion as it keeps up the due health of cattle, so does darkness accelerate the attainment of the required degree of fatness. The repose and contentment—the happy freedom from anxiety, arising from the certainty of receiving their food in proper time and measure—contributes so much to the fattening of cattle that a much more plentiful supply, given irregularly, cannot make up for the want of order. The hour for feeding, and the quantity of food, may be variously regulated, but a system when once adopted should be strictly adhered to.

The saline and earthy matter contained in the food is by no means an unimportant feature. The animal, it must be borne in mind, requires that the food or plants upon which it lives should supply phosphate of lime for the due formation of its bones, and saline matter for the blood; and it is a truly beautiful provision of Nature, that plants will not grow in soils which are destitute of those constituents required in the economy of animals: hence the advantages which are derived from the employment of such manures as bones, guano, Croggon's and other saline manures, or the urine of cattle, &c., in the growing of our commonly cultivated crops.

The due proportions of which these different constituents of the food are required by the animal, vary at different periods of its growth, and also at different stages of its approach to that degree of fatness which fits it for the shambles.

In the young and growing animal, there will be a much larger demand on the food than there would be in after-life. The muscles require to be enlarged by the addition of more gluten or muscle-forming principle than would be necessary to compensate for the natural waste which is continually going on in the body, and the food must supply an increased quantity of phosphates for the growth of bone; the lungs are more active, and a greater number of inspirations are made in a given time, by which more carbon is consumed: hence the necessity of supplying the growing animal with a richer and far more nutritious diet than would be required by the adult, and of feeding at shorter intervals.

Nature has prepared in the milk of the maternal quadruped a species of food suitable to the wants of the young animal; and a glance at its composition, which is pointed out by chemical analysis, will soon convince us how admirably it is adapted to fulfill the purposes in the animal economy:

TABLE IV.

COMPOSITION OF MILK.

Butter	27 to 35
Casein or Cheese	45 to 90
Milk-sugar	37 to 50
Phosphate of lime	3 to 10
Salts	7 to 10
Water	881 to 805

The sugar of milk, with the butter, supplies the materials which are consumed in the lungs of the young animal by which the animal heat is properly kept up. The casein, or cheesy matter, yields the materials for the growing muscles, and the gelatine of the bones; while the phosphate of lime, dissolved in the water, supplies the earthy matter for the bones. The quantity of milk, and the proportions of the ingredients which it contains, vary with circumstances, such as the breed of the cow, the food with which she is supplied, the time of her calving, her age,

and state of health. It is also materially influenced by the temperature of the atmosphere; warmth producing similar effects on the composition of the milk as on the fattening of the animal; the colder the air, the less butter will the animal yield in her milk. This fact is well known to farmers, the cause being the larger consumption in the lungs of the animal (to retain its heat against the cooling influences of the external air) of those principles in the food from which the butter is formed. As an illustration, I may quote an account of an experiment made under the directions of that practical agricultural chemist, Mr. Gyde, and which is well worth your notice.

"Six cows, during the warmest part of the summer of 1844, when in the field, yielded, on an average, 14 quarts of milk each; as the season advanced and the weather became colder, the quantity of milk steadily diminished, and of course with it the butter. In the early portion of November, four of the six cows were placed in a house, the floor of which was boarded in order to keep them dry. Light was nearly excluded, and the mean temperature of the house was kept at about 55°, the animals having barely enough room to lie down in their stalls; their diet was composed of cut turnips, hay, chaff, and a little ground lentil mixed with the chaff. For the first few days the animals were evidently uncomfortable in their new habitation, and their yield of milk diminished. At the expiration of three weeks the milk had again increased, and the quantity given was equal to that of the best yield of the summer. By the middle of December—the cold being then intense in the open—the cows gave 18 quarts each of rich milk, from which a proper quantity of butter was made. Animals when yielding milk require a richer food than when they are dry, since it is from the food taken that they are enabled to secrete their milk; and if their food does not contain a sufficiency of the elements required, the milk is less nutritious: hence the growth of young and suckling animals is less rapid, and its future health and strength of constitution suffer by the treatment which it receives when young. When sheep are fed upon turnips, and in winter, during the time they are giving suck, it is an excellent plan to allow a portion of oil-cake, or linseed, or pea or bean meal, as part of their daily food; such addition greatly improves the secretion of milk, the lambs grow rapidly, and fatten much earlier than when no such addition is made, and the sheep are found to be in much better condition in the spring. In the rearing of calves, likewise, it is desirable that they should have the whole milk, and not be supplied after the first two or three days with milk that has been skimmed, as is the custom in some parts of England. The practice of the late Earl Spencer, in feeding calves, was to allow them the unskimmed milk for the first three months, and afterward to give them skimmed milk for the first three months, and afterward to give them skimmed milk mixed with barley or oatmeal; this practice was found to succeed remarkably well; but I am inclined to believe that pea or bean meal mixed with linseed would have probably been better than oat or barley meal, since the bean and pea contain vegetable casein, which is identical in composition with the casein of milk, and forms an admirable substitute for it; while the soluble gum and mucilage of the linseed would be the more easily acted on by the stomach of the young animal than the insoluble starch of the oat or barley.

In fattening calves for veal, attention should be devoted to the production of fat animals of moderate size, veal of this description being most sought after by the epicure. The animal should be kept perfectly quiet, and placed in as warm a situation as convenient, that there may be as little loss of the fat-forming principle as possible; and a gloomy situation, not amounting to actual darkness, is found, by experience, greatly to assist the above means, by inducing tranquillity and a disposition for sleep. The food should be rich, and regularly supplied, and the strictest attention to cleanliness should be observed. Bleeding is occasionally resorted to by some feeders, and its effect is to check the too rapid development of muscle, while it does not interfere with the regular accumulation of fat in the body. Animals intended for stock should be allowed free exercise, that their muscular frames may be well developed; and their food should be of a nutritious character, containing sufficient gluten to supply the full demand of their growth. They should have sheds to go into at night and during rain, with a dry bed to lie upon; animals which are so treated will grow rapidly, fatten much faster when required, and be of a stronger constitution than those fed upon coarse, inferior, and unwholesome food, which is unfit to supply the demands of the system, producing an imperfect development of the animal frame, and not unfrequently engendering diseases of a troublesome and frequently a fatal character.

Time, gentlemen, warns me to conclude I have endeavored to detail in a few words, what is known on the subjects by our best animal physiologists, who have applied their theories to the rearing and feeding of cattle. If, by the knowledge I have imparted to you in this Lecture, you are enabled to promote your own interests, and that of the public, by better regulating the treatment of your live-stock, I shall not have addressed you in vain. I am the theorist, you are the practical men; your practice and my theory (or rather the theories of sound philosophers) combined, cannot, when properly managed, but conduce to your own pecuniary benefit, and that of mankind in general. Accept my thanks for your kind attention, and, for the present, I respectfully say, farewell. H. W. D

['The (London) Plough.']

LECTURES ON BOTANY.*

COURSE OF LECTURES ON BOTANY IN REFERENCE TO AGRICULTURE.

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LECTURE II.

OUR preceding Lecture was dedicated to the detail of a few of the advantages that have already resulted from the knowledge of a simple fact in vegetable physiology, namely, the influence of the external organs or parts of the flower in the production of the seed. It is a subject on which we might dwell at much greater length, as manifesting the vast importance of a branch of study that the practical cultivator, regarding it generally in the light of an abstract science, has hitherto considered rather as an amusement for the idle speculator, than as intimately connected with the practice of his profession, and illustrating those processes of his art that have been established by the slowly accumulated experience of himself and his predecessors. But this early stage of our inquiry is not the fitting place to extend our remarks upon the action of organs whose operation can scarcely be comprehended without reference to their own ultimate structure—in other words, to the minute organs or vessels of which they are themselves built up; and this observation applies not only to the flower, but to every part of the vegetable fabric: every product of the plant, whether cultivated for food or as adapted to the other almost innumerable wants and purposes of man—nay, its very existence—is dependent upon these.

A vegetable is a living being, and, as such, is made up of parts or members, all more or less influencing each other, and united and simultaneous in their operations for the growth and preservation of the whole. Some parts, when cut through, appear solid to the naked eye, others present a minutely porous appearance; but under a microscope or strong magnifying-glass the apparent solidity of the hardest and closest wood disappears. It is in these small and all but invisible cavities that the vital functions of the being before us are to be traced; it is here that are elaborated the starch, the gluten, the gum, the sugar, and the other proximate principles of our food; here are formed the tannin, the dye, the medicine; the production of the wood, the bark, the differing fibre of the flax and cotton, and the increase of the universal substance of the plant itself, are all of them processes dependent upon the economy of these mysterious recesses. The prying eye of curiosity is sometimes at fault in its endeavors to penetrate the sources of organic action, but a glance is often sufficient for the speculative mind of man to work upon and form a hypothesis which a second will enable him to improve into a theory, and although we positively know but little, that little enables us to assume a great deal, and this is especially the case as regards the science of Vegetable Physiology, or that which treats of the natural laws regulating the growth of plants and their productions, as just referred to. In giving you a general outline of the action of these laws, and endeavoring to explain the structure through which they operate, I shall avoid as much as possible reference to what is merely suppositious, relying upon the statement of facts, and such conclusions as, though in our present state of knowledge they are incapable of being positively demonstrated, are still so closely accordant with what we really do know, that, until they are contradicted by facts, we are justified in regarding them as such themselves.

Divide the stem of any common plant transversely or crosswise, and examine the section with a microscope, it will present the appearance of net-work, the meshes of which are of various sizes and figures, some perhaps regularly hexagonal, or six-sided, like the cells of a honey-comb, others more irregular, others square, and some circular; the circular ones are generally disposed in groups, which are sometimes scattered, sometimes arranged at corresponding intervals in a concentric manner. If we divide the same stem perpendicularly, or lengthwise, we find the angular meshes presenting a nearly similar appearance, showing them to be small, membraneous cells or cavities, while the circular ones are discovered to be sections of little tubes, more or less elongated, and narrowing toward each extremity so as to terminate in a point, and farther that they are disposed in longitudinal layers, or thread-like bundles. These cells and tubes are denominated the elementary organs of the plant; and minute examination of them shows that, independent of differences in form, size, and disposition, they vary greatly in structure, and are probably subservient, in consequence of that variation, to the performance of different functions; these functions, however, are, in our present state of knowledge, very imperfectly understood; of many, and those perhaps the most important, we are altogether ignorant; while others are little more than surmised from their apparent connection with some obvious fact in vegetable growth, such as the

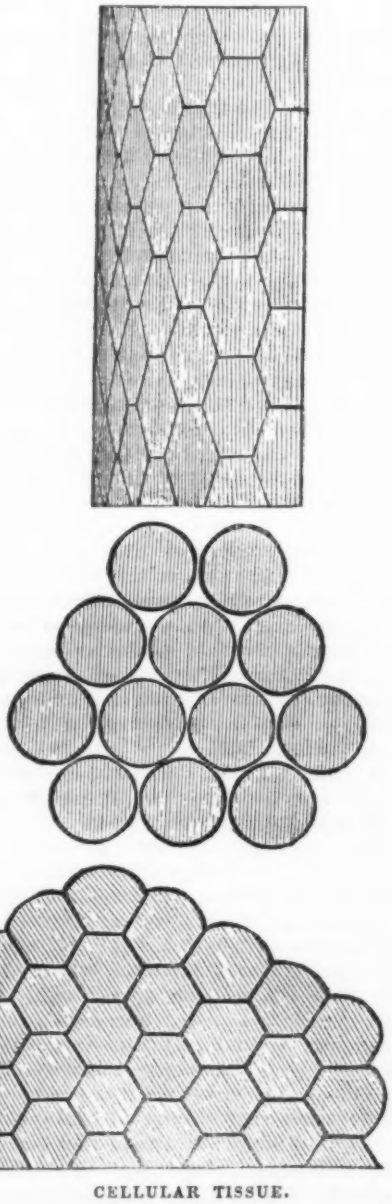
* Continued from page 377, Vol. II., Monthly Journal of Agriculture.

rise and distribution of the sap, &c. So very minute are the elementary organs of plants individually, and so obscurely revealed are their physical phenomena, even with the assistance of the most powerful microscopes, that few observers agree in their accounts of either, beyond the admission of certain general facts.

The simplest definable form of the vegetable tissue or substance appears to be the cellular, namely, that presenting in division the angular meshes just referred to; each of these meshes is the section of a cell, consisting of a very delicate transparent membrane, rudimentally globular, but assuming different figures in consequence of being pressed upon by others in the growing plant; when equally pressed on all sides by similar cells, the globe becomes twelve-sided, and of the form denominated by mathematicians the rhomboidal dodecahedron, which being divided in either direction, presents a hexagonal outline, resembling the cells of a honey-comb; where the pressure is unequal, the regularity of the cells is variously affected and distorted, and they become more or less oblong and rectangular, or present such a diversity of figures in different plants, and in different parts of the same, that the delineation of them would require a far greater space than our confined limits will admit, or the subject before us justify the dwelling upon, where a hasty outline will answer the end proposed, without entering into minutiæ belonging to the more abstruse and philosophical portion of the science. Cellular tissue constitutes a very considerable portion of the substance of all plants; the pith is wholly composed of it; so is by far the greater part of the bark, and the external covering of the more delicate organs; while, filling up the interstices left by the disposition of the woody and other tubular tissue, it seems to be almost analogous to fat in the animal economy, and, like that, increases so much, under certain circumstances, as to alter materially the general aspect and condition of the plant; it is indeed that part of the vegetable fabric that is the most influenced by cultivation. The magnified views in fig. 1 will convey some idea of the arrangement of the cells, and especially of the origin of their angular outline, which is very beautifully seen by the assistance of a microscope, or even by a good magnifying-glass, in a thin transverse slice of the stem of the common raspberry, or that of any other plant in which the pith is not invested by a very thick cylinder of wood. The size of these little cells varies from the fiftieth to the thousandth part of an inch in diameter, their average bulk being about midway between these estimates. In the earlier stages of their existence they are filled with a fluid in which a multitude of little colored bodies, only visible under a very high power of the microscope, are seen floating with greater or less rapidity—a phenomenon apparently as intimately connected with that of vegetable life as are those of the lymphatic and arterial canals to animal existence.

Cellular tissue has been justly denominated the basis of the vegetable fabric. The simplest of all known plants exists as a single globular or oval cell; those a degree higher on the scale are composed of similar cells, more or less elongated and attached end to end like the beads of a necklace; then come others more complicated by the attachment of cells in breadth as well as length, the lower or meaner of which present mere shapeless or irregular masses, while the remainder of the series, ascending by successive grades of structure, may be traced by the eye of the naturalist through a thousand varied and improving forms, so beautiful, so admirably

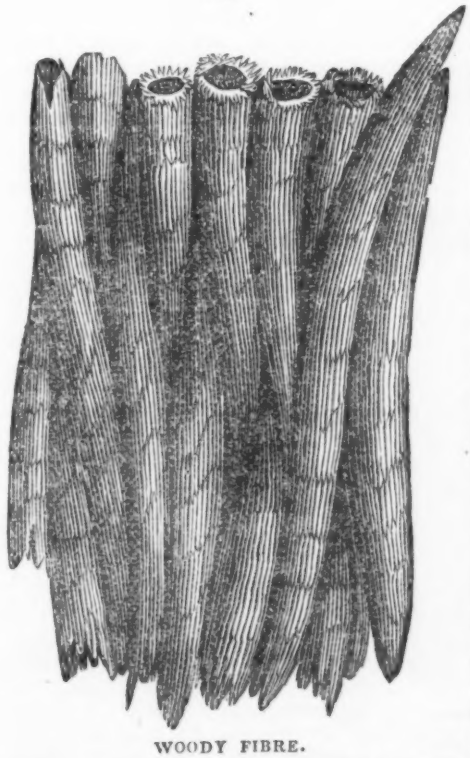
Fig. 1.



CELLULAR TISSUE.

adapted to the fulfillment of the offices allotted to them by Providence, as to force themselves upon the attention of man, though too distantly connected with his immediate interests to admit of his due appreciation of their value. Under myriads of modifications, which our space will not permit us to investigate, this tissue constitutes the whole substance of the lichens, sea-weeds, mosses, and other allied and equally neglected families of plants. However different in appearance such cells are from the little tubes with which they are found associated in all the nobler classes of vegetation, there seems at present to be scarcely a possibility of question that the latter are not merely the results of their super-development; in other words, that the tube, under whatever form it may exist, is but an elongated cell, or the breaking of the cavities of several into one. These, however, are speculations that we may hereafter refer to more particularly; let us look previously at the tubes themselves, and note what is known or understood respecting their uses in the economy of the growing plant, and first at those which compose the principal substances of the wood, its harder and tougher portion, called woody fibre.

Fig. 2.



WOODY FIBRE.

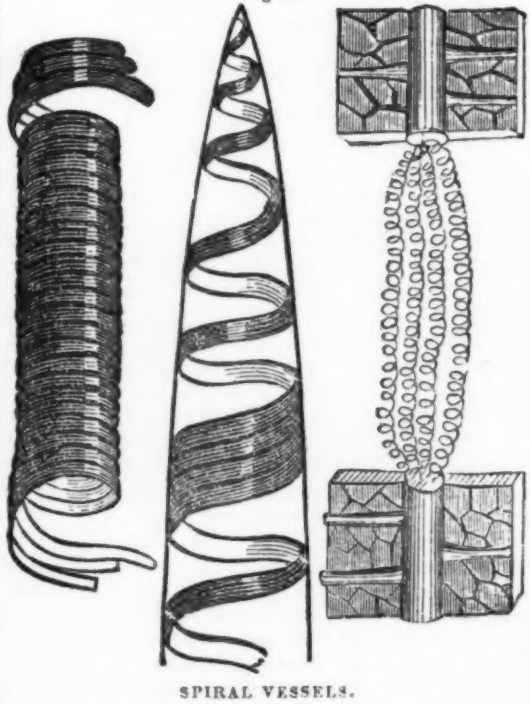
If the diameter of the cells just described is so small that without assistance from the microscope we are generally unable to distinguish their cavities, that of the woody tubes is frequently much less, and in some plants not more than the five-thousandth of an inch. Fig. 2 represents a small fragment of oak wood highly magnified, showing it to consist of such tubes closely disposed upon each other, so as to occupy the smallest possible space, and leave no openings between them, the narrow, tapering or attenuated extremities of each generally lying between the broader portions of those that lie around them. These tubes extend in the form of continuous bundles or layers from one extremity of the plant to the other, sending out branches into the leaves and other subsidiary organs, and giving strength to, and maintaining communication between all its parts; they constitute the channels through which the sap ascends and is distributed, a fact readily ascertained by cutting into the stem or branch of a vine, birch, or any other tree in the spring, when that fluid may be traced as flowing from the mutilated vessels of the wood. The passage of the sap through this medium, though certified by long observation and repeated experiment, would appear to those who examined the vegetable texture for the first time, or without a previous acquaintance with the natural phenomena connected with organization, as an inexplicable mystery, no apertures being discernible under the highest powers of the microscope, through which the cavities of the woody tubes communicate with each other. The discovery, however, by Mons. Dutrochet, of the permeability of vegetable and animal membranes, or that they are capable of transmitting fluids through their substance, although destitute of any apparent passage of communication—a phenomenon to which he gave the name of *Endosmosis*—has contributed greatly to the elucidation of this and other physiological facts, that were as stumbling-blocks to the philosophy of our forefathers. The demonstration of this important fact is easy, and within the reach of those even whose means of scientific inquiry are the most limited, as instanced in one of the earliest experiments of Dutrochet himself: he filled the swimming-bladder of a carp (any other small bladder will answer the same purpose, and any fluid heavier than water) with a thin solution of gum, and, placing it in a glass of water, observed that the bladder swelled out and became heavier, in consequence of the water being attracted through its substance by the weightier fluid within: he reversed the experiment by filling the bladder with water, and placing it in the mucilaginous solution, under which circumstances it lost weight, by the water passing out instead of in. It was afterward ascertained by numerous experiments that plants placed in water draw it up through the thin tissue of their cells and woody tubes, and acquire a great increase of weight, which they lose again, at the will of the experimenter, by simply adding to the water in which they stand some soluble substance, sugar, for instance, that renders it heavier than their contained juices. The force of this attraction, and of course the facility with which the fluid passes, is very

considerable; water holding half its weight of sugar in solution raised pure water through membrane with a power capable of sustaining the pressure of a column of mercury of 127 inches in hight, a power nearly four and a half times greater than the pressure of the atmosphere which sustains the mercury in the barometer and raises the water in a common pump. On the cause of this curious phenomenon philosophers are not agreed: it is probably only one of those numerous instances that are from time to time brought to light by inquiry into the hidden processes of Nature, of the general tendency of matter to maintain an equilibrium among its particles: but the permeability of the vegetable membrane being established, it is not necessary to our present purpose to pursue the subject farther: we have only to consider, as a natural consequence of the development of the living plant, that the sap becomes thicker as it ascends from the root, drawing after it the thinner and more recently imbibed fluid, to account for its successive rise through the minute vessels above described—a rise so rapid that several quarts or even gallons are obtainable daily for weeks together by tapping the trunks of some tropical trees.

The fibre of hemp, flax, and of many other plants employed in different parts of the world in the manufacture of cloth, cordage, &c., consists of these woody tubes; and some idea of their extreme tenuity may be formed from the examination of the finest flaxen thread by a microscope, which shows it to consist of a considerable number of tubes. The membrane composing them, though delicate and transparent, possesses much strength and elasticity in most plants, and in all cases is greatly superior in that respect to cellular tissue, the membrane of which is comparatively brittle; the difference in the strengthof cotton and linen thread is an instance of this, the former being cellular, the latter woody tissue. The wood of the fir tribe appears to be very dissimilar to that of ordinary trees and herbs, the tubes being marked with dots or apparent pores, surrounded by a series of concentric circles; similar markings are observable in the woody tissue of a few other tribes, but only such as, like the plants in question, produce aromatic or resinous secretions, whence they have been generally regarded as glands; their structure is, however, at present very imperfectly understood, and not anything is known respecting their functions; if really openings, they constitute a remarkable exception to the closeness of the corresponding tissue in other plants.

The name of duct has been given to various comparatively large tubes or vessels, generally associated with those of the wood, but always distinguishable from them by their greater diameter. The large pores, frequently observable by the naked eye in a transverse section of wood, are the divided cavities of the vessel so called, which are sometimes distributed through the layers of wood, but more commonly form themselves distinct layers or bundles. Many vessels of different structure have been confounded under the general name of duct; and being wholly unacquainted with their offices in the economy of the plant, much diversity of opinion exists among physiologists respecting their classification and relative uses. Some are angular, and very evidently formed by the breaking of cells longitudinally into each other, or by the absorption of the dividing membrane; others are dotted with apparent pores; a third kind are more or less distinctly marked with spiral lines, sometimes continuous, occasionally broken at irregular intervals, as though a spiral thread contained within a membrane had had its coils separated and ruptured in places by the longitudinal growth or extension of the membrane; a fourth series, called annular ducts, consist of concentric rings, or perhaps of the coils of spiral threads so broken as to present the appearance of such, and held together by the membraneous tube containing them. These larger tubes are disposed in a similar manner to the smaller ones of the wood, and resemble them in being more or less narrowed or conical at their extremities: several of their forms, and there are some intermediate between those described, approach so nearly to the following form of tissue, that it is difficult to conceive

Fig. 3.



SPIRAL VESSELS.

them other than more imperfect or disurbed modifications of the same, viz., the spiral vessel.

This last form of the vegetable elementary organs consists of one or more filaments coiled spirally within a very delicate membraneous tube, similarly attenuated toward either end as are those of the wood and the duct, but, unlike the spirals apparent in some of the latter, capable of being drawn out like a spring, when the part containing them is broken. They are very advantageously seen by breaking carefully across the leaf of a rose or strawberry, or the young brittle shoot of the rose, and drawing the parts slowly asunder, as exhibited in fig. 3. The spiral coils are in most instances so close together as to appear to form the tube, and the membrane which invests them is so exceedingly fragile as to break between each coil of the spire when it is drawn out, so as not to be readily discernible unless occasionally when the extremity of the filament is relaxed, as represented in one of our figures. Each spiral is generally composed of a single filament or thread, but in some plants the number of parallel fibres twined in the same direction is considerable; one of the figures exhibits a magnified view of a portion of such a vessel from the stem of a banana, consisting of three threads or fibres; but in this, and many other plants of the same and allied orders furnished with compound vessels, there does not appear to be any regularity in their production. De Candolle remarks that the number of threads composing each spiral of the plant just referred to varies from seven to twenty-two; but they are sometimes formed of a single thread, and I have found in the same portion of the stem no fewer than eleven different modifications of these curious vessels, varying in the number of their threads from two to twenty-nine, the largest number which has, to the best of my knowledge, been met with in any plant. The size or diameter of the spiral tube is exceedingly variable, the largest being about the three-hundredth or four-hundredth of an inch, while in some cases they are not above the two-thousandth or three-thousandth. They are variously distributed, but chiefly in the young stems or shoots, in which they occupy that cylinder of woody substance that immediately surrounds the pith, called the medullary sheath, and in the stalks and veins of the leaves and other organs which are modifications of them and originate from the sheath in question. They are of very rare occurrence in the root, and still more so in the bark and the true wood, or that which in after periods of growth forms around the first year's layer. Where the tissue of the stem is not stratified, and the pith or cellular substance does not form a separate cylinder or column in its center, as in the liliaceous orders, palms, and others belonging to the same great natural class, the spiral vessels accompany the bundles of woody fibre and ducts that lie dispersed through its mass, and are present often in such abundance as to constitute the most remarkable feature in their internal structure; from the stems and bases of the large leaves of the banana and plaintain they may be drawn out by the handfull, and in the West Indies are sometimes collected in this way for tinder.

The use of the spiral vessels in the vegetable economy is, like that of their other minute organs, rather to be surmised than demonstrated. A very general opinion, from the earliest period of their discovery, regarded them as organs of respiration; hence their denominations of "trachea" and "trachenchyma," alluding to their supposed correspondence in function with the trachea (or windpipe) and air-tubes in the lungs of an animal; to those of insects their structure presents a remarkable parallel. They are generally filled only with air; and although instances may occur in which they are "gorged with fluid," such instances are rare, and probably either accidental, or arising from one of those morbid changes to which the minuter portions of the vegetable fabric are unquestionably liable, although their causes are hidden in consequence of our imperfect knowledge and slender means of inquiry. The opinion, however, founded only upon analogies that may be rather fancied than real, seems of late years to have been gradually losing ground in the estimation of some of the best physiologists, although they have been hitherto incapable of substituting a more plausible hypothesis; and the principal argument that can be adduced against that previously entertained, consists in the fact that the spiral vessels of plants are not in immediate connection with the surface pores or stomata, nor even with the air-chambers with which the latter communicate, and hence differ from those accompanying the breathing apparatus of an insect. When, however, we reflect upon the permeability of the vegetable membrane to a comparatively gross fluid like the sap, the passage of one so thin and infinitely more diffusible as air can scarcely be denied, even though it had to penetrate to a much greater depth than to the interior of a leaf, an organ the structure of which is so strictly accordant with its supposed and almost experimentally-proved function as the vegetable lung.

Under whatever conventional name the elementary organs are known, however great the apparent difference of their structure, and diversified their functions or offices, the deep and unwearied researches of modern naturalists aided by the increased powers of observation placed at their command by the improvement of the microscope, have led to the conclusion that they are all only so many modifications of the cell, while the wall of the cell itself is probably merely consolidated mucus, assuming the form of membrane or fibre, according to laws of which we are at present ignorant. That changes take place of one kind of tissue into another, at different stages of the growth of the plant is unquestionable, as well as that such changes are correspondent with alteration of function; but it is no less

certain that the simple cell contains the rudiments necessary to the formation of the other organs, and especially the spirals, which in their most perfect state appear to be the most complicated of the whole series. "There is no doubt," observes Dr. Lindley, speaking of the different kinds of vegetable tissue, "that all these forms are in reality modifications of one common type, viz., the simple cell, however different they may be from each other in station, function, or appearance. For, in the first place, we find them all developed in bodies that originally consisted of nothing but cellular tissue; a seed, for instance, is an aggregation of cells only; after its vital principle has been excited, and it has begun to grow, woody tissue and vessels are generated in abundance. We must, therefore, either admit that all forms of tissue are developed from the simple cell, and are consequently modifications of it: or we must suppose, what we have no right to assume, that plants have a power of spontaneously generating woody, vascular and other tissues, in the midst of the cellular." Mirbel has lately reduced the first of these suppositions to very nearly a demonstration; in a most admirable memoir on the development of Marchantia, he speaks to the following effect: "I at first found nothing but a mass of tissue composed of bladders filled with little green balls. Of these some grew into long, slender tubes, pointed at each end, and unquestionably adhering by one of their ends to the inside of the sac; others from polygons passed to a spherical form in rounding off their angles. As they grew older, other very important changes took place in certain cells of the ordinary structure, which had not previously undergone any alteration; in each of these there appeared three or four rings placed parallel with each other, adhering to the membrane, from which they were distinguished by their opaqueness; these were together analogous to annular ducts. The cells which became tubes did not at first differ from other cells in anything except their form; their sides were uniform, thin, colorless and transparent; but they soon began to thicken, to lose their transparency, and to be marked all round from end to end with two contiguous parallel streaks disposed spirally. They then enlarged and their streaks became slits, which cut the sides of the tubes from end to end into two threads, whose circumvolutions separated into the resemblance of a gun-worm." In these cases there can, I think, be little doubt that the changes witnessed by Mirbel were chiefly owing to the development of a spiral thread in the inside of the tissue.

There is much diversity of opinion as to the mode in which the elementary organs of vegetables are multiplied during the advance of growth, and the rapidity with which that growth proceeds in certain plants is such as to render actual observations as to its source exceedingly difficult; speculation has therefore sometimes taken the lead where sober inquiry has proved at fault, pointing at results almost too startling even for human imagination to receive as truth; and yet, when we contemplate from day to day the increasing size of many plants in ordinary cultivation—a gourd, for instance, or vegetable marrow, adding to its circumference nearly three inches in the course of the twenty-four hours, and the stem which bears it extending its length between five and six inches during the same period, common sense would pause ere it questioned the truth of records much more marvelous. The rapid growth of the common mushroom has become proverbial, but some other individuals of the class of fungi greatly exceed it in that respect; the Phallus or stink-horn sometimes elevates itself six inches from the ground in the space of an hour; the Bovista gigantea, or great bull puff-ball, is recorded to have grown in the course of a single night from a mere point to the size of a large gourd, the actual measurement of which is not mentioned, but on a moderate computation of the diameter and number of the cells, it has been estimated to have increased at the rate of 4,000,000,000 of cells in every hour, or upward of 66,000,000 in a minute. It is true that much of this enlargement may have arisen from the distention of the cells individually; but even if this be admitted, the force of development and the vast increase of weight, which can only be accounted for by an appropriation of nutriment so rapid as almost to elude conception, leaves sufficient of the wonderful to impress upon our mind a just idea of the grandeur of that vital energy which inspires and regulates the growth of bodies thus low in the scale of organic nature.

The force with which the minute organs above described are produced and enlarged is no mere supposition, but a fact within the reach of attestation by those who will condescend to observe its operation; the root of a tree descending through a crevice will break and dislocate the hardest rock; cellular tissue, not harder in substance than pith, has elevated a weight with the power of a lever; the latter effect is not unfrequently seen in the growth of fungi under stones and heavy blocks of timber; and the following anecdotes, both, I believe, referring to the same circumstance, and copied from the *Hampshire Advertiser* of July, 1830, are recorded by Professor Burnet as affording a striking instance of this power: "At different times, several of the stones in the pavement in the town of Basingstoke, were observed day by day, to be rising gradually from their beds, until they were some inches above the ordinary level; under one of these, which weighed seven pounds, a large mushroom was found, that measured a foot in circumference." The other case is recorded by Mr. Joseph Jefferson, who says: "A toadstool six or seven inches in diameter, raised a large pavingstone an inch and a half out of its bed; and the mason who had the contract for paving was much enraged at the idea that a weak fungus

should have lifted so heavy a weight. But his uneasiness was much increased, and even his alarm excited, when, about a month after the injury had been repaired, the adjoining stone was lifted in a similar manner, and two mushrooms, not quite so large, were found beneath it; for it seemed doubtful whether the whole town of Basingstoke might not want repaving during the term of his contract. The stones were nearly of the same size; each being twenty-two inches by twenty-one; the last stone raised in this manner was weighed, and its weight proved to be eighty-three pounds." The hardest of such fungi are, in the growing state, so soft as to yield to the pressure of the finger, and so brittle as to be shivered to atoms by the slightest blow; yet the organic force with which their tender tissue is developed is capable, acting in millions of points, in the growth and distension of their individually invisible cells, of elevating an inert mass of stone which the strength of an ordinary man would with difficulty raise from its plaster bed.

Such are some of the facts connected with the minute anatomy of plants, the farther examination of which, and of the laws of their growth, will furnish the subject of a succeeding lecture.

PLANT MORE TREES.

Under the above head the Farmer's Monthly Visitor has a capital article, from which we learn several interesting facts. The editor truly remarks that "Valuable pine timber lots are now grown, whose origin was in the seed less than fifty years ago." The opinion has pretty generally prevailed that pines grown by artificial culture are nearly worthless for timber. We see no reason why this should be so, any more than oak, chestnut, or ash. Mr. H. remarks that "Nature does everything to make up for man's neglect in the planting and growth of trees; nor is she slow in her operations. She has made every acre of waste land in New-Hampshire valuable. The beautiful chestnut timber so much used in the New-England railroads grows spontaneously in all our poorest rocky lands which have been considered too hard for cultivation; the railway chestnut cross-timbers are worth, standing, on the average, sixteen cents apiece—trees of the suitable size making sometimes three and four cuttings. It is said these chestnut trees will grow to the suitable size of posts in the years that these posts rot in the ground. A remarkable feature in the chestnut is that where a main tree is cut, sprouts the same year shoot forth from the roots, growing up a clump of trees, some three to six of which soon grow into sizes to be used for timber."

We have had some little experience in attempting to raise a small forest of chestnut timber from the seed, but with poor success. We have been told that the seeds should never get dry after they ripen in the fall, before they are planted, either in pots or a nursery. Such is the demand for fence posts and railroad ties that the culture of chestnut timber, we are confident, can be made profitable. Every farmer has a wood lot, and as he thins it out, or cuts it off, he should set the ground full of small chestnuts. Under favorable circumstances they grow rapidly.

It is safe to calculate on the growth of a cord of wood on an acre per annum in Western New-York. This, at $2, is much better than no income—while the annual burden of leaves that fall to the earth enrich the land.

Shade trees are equally an ornament and luxury during the intense heat of our summer months. Speaking of these the Visitor says: "We boast in the southerly part of the Concord Main-street as beautiful elms as can be shown in any part of the world. There are many charming villas in the country range about Boston; but we must say of these that their cleaned path avenues shaded and covered over by trees high before reaching the limb, or surrounded by the shrubbery which entirely shuts out access of foot or of eye, do not compare with the unadorned beauty of the row of elms opposite on the street to the place of our writing. There is a remarkable similarity in the spread of the isolated elm, which is a native of our intervale and stands either on that or the first upland of the river bank. The men who set out our stately elms seventy-five and a hundred years ago, Hall, Shute and others, have passed away: at this season, when hundreds of birds come there and build their nests, the elegant gold-robin, the gay bluebird, the chattering wren, and even the shy crow, blackbird, the snarling cat and scolding thrush both sing so beautifully and so alike when undisturbed as to be mistaken each for the other—there is a charm in these venerable trees which bids us remember those who planted them there, and to present them as proof that planting trees is one of those "good deeds" of men which "live after them."

To Cure the Distemper in Horses.—Give a teaspoonfull, three times a day, of finely powdered gum myrrh, (mixed with the food or otherwise,) and a speedy cure, it is said, will in all cases be effected.

DAIRY HUSBANDRY—THE DAIRIES OF HOLSTEIN.

The use of steam every year for a greater variety of purposes, the laying down of rail and plank roads, and opening canals, are working revolutions in the industrial economy of all sections of the country. This liability to change of circumstances requiring corresponding changes in the habits and pursuits of different localities, imposes the necessity for a greater variety of knowledge—that is, for a practical knowledge of a greater number of pursuits than formerly.

A grazing district this year may next year be converted into a farming one by being penetrated by a railroad and presented with facilities for transportation which it had never before enjoyed. We have long been impressed with the belief that, along with their fine climate, and cool fountains, and fragrant herbage in the mountain regions of the Southern States, there should be large flocks of sheep and ample dairies for the manufacture of butter and cheese—articles that, if well made, will bear to be kept until remunerating prices will pay for producing and sending them to market. To some of our patrons who entertain the same views—in fact to every curious and polite inquirer, we feel persuaded we may be making an acceptable offering in the following paper on

THE DAIRIES OF HOLSTEIN.

Holstein butter is said to be (with the exception of that made in Holland proper) the best in the world. It may not be uninteresting to our readers to describe the process adopted in that Duchy for making that valuable article.

The Duchy of Holstein (together with the Duchies of Schleswig and Lauenburg) lies in a favorable position for commerce, being bounded by the Elbe and the German Ocean on the west, and by the Baltic on the east, while a ship canal unites the two seas. The climate is temperate, inclining to moisture; it does not materially differ from that of the midland country of England, except that the cold is more steady and severe in winter, while the summers are warmer and drier. The night-frosts in April and May are the most unfavorable circumstance affecting the interests of Agriculture; they are felt more than in England because the heat of the sun in the daytime is greater and the contrast, therefore, the more prejudicial. The soil is rich, and often receives accessions from the depositions of the river Elbe. The peculiarities of management in the Holstein dairies relate to the buildings and utensils; to the time of milking and number of hands employed; to the management of the milk; and to the mode of working, salting and packing the butter. These have been described by Mr. Carr in a communication to the Royal Agricultural Society, and may be thus shortly stated:

The buildings on a large dairy are a milk-cellar, a butter-cellar, a churning-house, with a horse-mill adjoining, a cheese-room and a kitchen, in which the utensils are washed and food is cooked for all persons immediately engaged in dairy work; to which are sometimes added their sleeping-apartments. The size and situation of the milk-cellar are deemed of great importance: it fronts the north, and is shaded from the summer sun by rows of trees, the elder being chosen especially, and planted as near the windows as possible, on account of the influence of this tree in keeping off insects. A thatched, projecting roof affords protection from the heat, and great care is taken in choosing the site of the dairy to place it out of the reach of anything that might taint the atmosphere. The size of the milk-cellar is regulated by the number of cows, but it is generally calculated to contain the produce of four milkings. The milk-dishes are placed on the floor, and usually occupy the space of two feet square each. Thus the produce of one hundred cows giving on an average eight quarts per day, would fill fifty milk-dishes at each milking, and would require a ground surface of five hundred square feet, as there must unavoidably be space left to enable

the dairy-maids to go through their various operations. The floor is sometimes flagged, but oftener of brick neatly fitted, so that no water may lodge in the joints, and always gently inclined, with a grating at the lower end to facilitate the washing of the floor, which is never omitted to be done twice a day, notwithstanding that every source of impurity is guarded against and every drop that may fall at the time of the milk being strained is carefully wiped up. A recent improvement is the dividing the floor into compartments with brick ledges from three to four inches high, between which the milk-dishes stand; the lower extremity of these compartments is fitted with a small sluice, and twice a day they are filled with cold water from a pump. Thus the milk is preserved so cool as to prevent all approach to acidity for several hours longer than when placed on a dry floor. In sultry weather a piece of pure ice is sometimes dropped into each milk-pan, or a pailfull of ice is placed in the dairy, which, by absorbing the heat, sensibly lowers the atmospheric temperature.

The best milk-cellars are sunk from three to four feet in the ground; they are from sixteen to eighteen feet high, with an arched roof, and two rows of windows looking north, east and west, to secure a thorough air. The lower range of windows consists of wooden trellis-work, provided inside with gauze frames, to exclude insects, and outside with hanging shutters, which can be lowered and elevated at pleasure. The upper range is furnished with glass sashes, which are exchanged for gauze frames when greater coolness is needed.

The butter-cellar also is light, airy and cool; it is likewise sunk in the ground and supplied, by the same means as the milk-cellar, with plenty of pure air. Here the butter, when carried from the churning-house, is worked, salted and packed. The filled butter-casks are ranged on clean boards a little elevated from the floor, to allow of a free passage of air, and are turned and wiped every week. Next in order comes the churning-house, which has much the same arrangements as we find common in England. Of late years the perpendicular movement of the churn-staff has been exchanged for the rotary, which is found to churn in a shorter time, and with less risk of oiling the butter. The cheese-room in these dairies is placed as far as possible from both the milk and the butter-cellars.

The persons required to conduct the business of the dairy are an overseer, a cooper, one or two cowherds, one or more swineherds, an upper dairy-woman, and dairy-maids in the proportion of one to every eighteen cows. The overseer takes care of the cattle, and is expected to know their diseases and the remedies. He is responsible for the conduct of the swineherd and cowherd, and superintends the fatting and rearing of calves. He also sees that the milking is thoroughly performed. When the number of cows does not exceed a hundred, he also undertakes the cooper's work; but in large dairies a cooper is kept in addition, who, besides his particular duties, assists in carrying the milk, feeding the cows when housed, &c. The wages of these two persons vary with the extent of the dairy, but may be averaged at sixty dollars for the first and forty for the second per annum.

The dairy-maids, besides milking, cleaning the vessels, &c., work in the garden in summer, spin in winter, and wash, bake, brew and cook for the establishment under the direction of the upper dairy-woman, who is by far the most important personage therein, as on her skill, attention and diligence depend, in a great measere, both the quantity and quality of the product. She must not only thoroughly understand, but accurately observe, the moment when the milk should be creamed; the degree of acidity it must attain in the cream-barrels; its temperature, whether requiring the addition of warm or cold water to the churn; as well as the subsequent operations of kneading, beating, salting and packing the butter. She must be punctiliously clean in her person and work, and require the same cleanliness of her maidens. In large establishments the upper woman has full employment without milking, and even requires assistance in her own department; but in smaller dairies she milks about ten cows. Her wages are from fifty-five to sixty dollars per annum, while her chief assistants receive twenty-two and the rest eighteen dollars.

During summer the dairy people of Holstein rise at three, or even two, in the morning, if the weather be very hot; for which exertion they are allowed two hours' sleep in the middle of the day. The milking is carried on in the field,

generally commencing at four, and lasting two hours. Each girl marks her own cows, by tying a particular colored ribbon around their tails; and in some places each milker carries a string, on which a knot is made for every cow that is milked, to prevent any from being forgotten. The fields are large, and often at a great distance from the dairy, but the milk is safely and easily transported by means of a long, low, four-wheeled one-horse wagon, in the side-bars of which strong iron hooks are inserted at such distances that the milk-pails, containing from thirty to forty quarts each, may swing free of each other; and these, though filled nearly to the brim, are prevented spilling by merely having thin pieces of wood, about the size of a dinner-plate, floating on the surface. The milk, when brought to the dairy, is immediately strained through a hair-sieve into the vessels placed to receive it. These vessels are of various materials: they may be of wood, earthenware, copper tinned, zinc, cast-iron lined with a China-like composition, or glass.

In order to secure butter of a first-rate quality, the cream is removed from the milk before any acidity is perceptible, and it has been found that a cellar temperature of from 60° to 62° Fahrenheit is the most favorable, allowing a complete disseverment of the cream in thirty six hours; whereas a greater degree of warmth, while it quickens the separation, still more hastens the souring process, which injures both the quantity and quality of butter. In a cold temperature the separation is effected much more slowly, so that forty-eight and even sixty hours may be required: this, however, is the longest period which can be given without the risk of imparting a rank, unpleasant flavor to the butter. The first signs of acidity in milk are a very slight wrinkling of the cream, and a scarcely perceptible acid taste. The moment this is observed, the skimming commences, even if the milk have stood but twenty-four hours. The cream is poured through a hair-sieve (which is kept for the purpose and never employed in straining the new milk), into large barrels, containing about two hundred and forty quarts each, in which it remains until it is sufficiently sour, being stirred at intervals to prevent its becoming *cheesy*. The next object of the dairy-woman's skill is the degree of warmth or coolness which must be imparted in order to secure good butter.

In warm weather the churn is rinsed with the coldest water, in which a piece of pure ice is often thrown, and sometimes, though more rarely, cold spring water is added to the cream about to be churned, which operation is then always performed either very early in the morning or late in the evening. In cold weather, on the contrary, warm water is applied both to rinsing the churn, and to the cream itself.

The churning being completed, the butter is taken off by means of a large wooden ladle, and carried in a tub directly to the butter-cellar, where it is cast into a large trough, hollowed out of the trunk of an oak or beech, very smoothly polished inside, and provided with a plug-hole at the lower extremity, beneath which a small tub is placed to receive the expressed milk. There the butter is slightly worked, and salted with the purest salt, then moulded with a wooden ladle into a mass at the upper end of the trough, and left for some hours to soak and drain. In the evening it is thoroughly kneaded and beaten, or rather slapped, the dairy-maid repeatedly lifting a piece of from three to four pounds, and slapping it with force against the trough, so as to beat out all the milky particles; and thus lump after lump being freed from extraneous matter, the whole mass is spread out, receives its full proportion of salt, about an ounce and one-eighth per pound, which is worked with the utmost care equally through it, and again moulded into one compact mass. The butter in Holstein is scarcely ever washed, as water is believed to rob it of its richness and flavor and to be unfavorable to its preservation.

When a quantity is ready, sufficient to fill a cask, the several churnings are once more kneaded through, a very little fresh salt added, and the butter is packed in a barrel made of red beech-wood, water-tight, which has been prepared by careful washing and rubbing on the inside with salt. Great care is taken that no space shall be left either between the layers of butter, or the sides of the cask. In large dairies a cask is never begun to be filled until it can be completed, as thus alone the butter can be exactly of the same flavor and color throughout. The qualities of the excellent butter on which the Holsteiner prides himself, are *first*, a fine, even, yellow color, neither pale nor orange-tinted; *second-*

ly, a close waxy texture in which the extremely minute and transparent beads of brine are perceptible; but if these drops be either large or in the slightest degree tinged with milk color, it is considered as marking an imperfect working of the butter, while an entirely dry, tallowy appearance is equally disapproved; *thirdly*, a fresh fragrant perfume, and a sweet kernely taste; *fourthly*, the quality of keeping for a considerable time without acquiring an old or rancid flavor.

There are four qualities or varieties of butter known in Holstein. These are named, *Fresh-milk*, *May*, *Summer*, and *Stubble* butter, according to the season in which each is produced. The Fresh-milk butter is that made in the spring, between the time when the cows calve and their being turned out to pasture. The May butter is that produced in May, after the cows have been sent to grass. This is highly prized for its peculiarly fine aroma when fresh, but is found not to keep well, and, therefore, like the Fresh-milk butter, is generally sent to market as it is made. The Summer butter is made in June and July, and from that time till the cows are removed from pasture, the butter bears the name of Stubble butter. Both these latter sorts, if properly made, keep well, and retain their fine flavor nearly unimpaired until the following spring. The small quantity produced between the time of the cows being housed and becoming dry, is called *old-milk* butter, and is least of all esteemed.

In winter, when the cows are confined to dry food, and the butter loses its fine yellow color, artificial means are employed to remedy the defect; for the Holstein merchants find that without the usual degree of coloring, their butter will not in some markets (as in Spain and Portugal) fetch its accustomed price. The ingredients used for this purpose are a mixture of annatto and turmeric, in the proportion of five ounces of the latter to one pound of the former. These ingredients are boiled in butter for half an hour, stirring them frequently, and then straining through linen. The preparation can then be kept for use. When butter is to be colored, a portion of this mixture is melted over the fire: it is then poured into a hollow made in the mass of fresh churned butter, and by rapid stirring is intimately united with the butter immediately in contact with it, which being then spread over the whole mass, is, together with the requisite proportion of salt, carefully kneaded and worked through until no particle remains more highly colored than another; and when smaller portions have thus been colored from day to day, before a cask can be filled, the whole must, before packing, be kneaded once more, that no disparity of shade may disfigure it.

The greater portion of the butter made in the dairies of Holstein and Schleswig, is bought up by the Hamburgh merchants, though it is likewise sent in considerable quantities from Keil and other parts to England and Copenhagen, and the West Indies.

We have already noticed the importance attached to every particular relating to the milk-cellar, and the utensils employed in making this celebrated butter. The different materials used for milk-pans were named, and we may now give some farther notices from the same authority on this head. Various kinds of utensils have been tried in Holland, in the hope of discovering how, in hot weather—more especially when a thunderstorm is gathering—the milk can be kept from too early an acidity. Those in most general use are shallow wooden vessels, nearly of an equal diameter at top and bottom, containing, when full, eight quarts—but in which, during summer, seldom more than six quarts are poured. The chief disadvantage of these vessels is the great labor and attention required to remove all acidity, which, in some states of the atmosphere, is almost unavoidable; and which, penetrating the pores of the wood, sometimes resists all the patient scrubbing, first with hot water and small birch-scrubbers, and secondly, with boiling water, and a hard round brush made of pig's bristles, with which every part of the utensil is carefully polished over. Sometimes the dairymaid is compelled to resort to washing in a lye of wood-ashes or boiling, or even scorching over lighted chips, followed by countless rinsings in pure spring water. To diminish this labor the milk-venders in town paint the milking-pails and dishes with a preparation of cinnabar, linseed-oil and litharge; but this is expensive, for the vessels require three coats of the composition at first, and one yearly afterward—and, after all, the milk, for some days after these vessels are brought into use, has a perceptible taste of paint. Tinned copper milk-pans are very

costly, and require constant watching, lest they should require re-tinning. The zinc pans are yet but little known, and their value not sufficiently proved. Cast-iron lined with enamel are durable and very clean, but too expensive. Glass pans have many opponents on account of their brittleness. The testimony of Mr. Carr, however, is *decidedly in favor of this material.* He says that in his dairy (which is supplied by 180 cows,) the glass vessels have been used for four years. They are sixteen inches broad at the top, and twelve at the bottom: the glass is dark bottle-green, transparent and perfectly smooth, about one-eighth of an inch thick, and furnished with a round rim at the upper edge, which makes it easy to retain a safe hold of them even when full. They would contain eight quarts, but never receive more than six. "They cost eight-pence apiece, and their durability may be estimated by the fact that, to encourage carefulness, each dairy-maid is allowed one dollar extra as pan-money, being bound at the same time to pay ten-pence for each one she breaks; yet hitherto," says Mr. Carr, "no girl has broken to the extent of her dollar." The great advantage of these vessels is in the saving of time, fuel and labor they effect, for they merely require to be washed in luke-warm water, then rinsed in cold water, and put in a rack to dry. Supposing, therefore, (which Mr. Carr does not admit,) that the milk, during summer, becomes sour sooner, and consequently throws up less cream, in glass than in wood, this disadvantage would be more than counterbalanced by the diminished expenditure of glass vessels; for, of course, where time and labor are saved, the number of domestics may be lessened.

Cow-houses in Holstein are generally twice as long as broad, and calculated for four cows lengthwise, standing head to head, with passages between, floored with brick, and furnished with feeding and drinking troughs. One passage, if not both, is broad enough to admit a loaded hay-wagon, and is provided with large folding doors at each end, while there is also room behind the cattle sufficient to permit the manure being sledged out with a horse without incommoding them. The lofty roof affords accommodation for hay and straw, which helps to keep the house warm in winter; the doors are kept shut as much as possible during that season, sufficient light being admitted by small glazed windows. The quantity of food which can be afforded to cows during winter is ascertained as soon as the harvest returns are known. In plentiful seasons the calculation is that each cow should be allowed three sacks of grain, (generally oats, 140 pounds each sack,) 3,900 pounds of straw, including bedding, and 1,800 pounds of good hay; while for every hundred pounds of hay less, she receives twenty-five pounds of grain more, or *vice versa.*

There are three distinct breeds of cattle in the Duchies—the native cow, the marsh cow, and the Jutland cow. The first is middle-sized, with fine head and horns, and moderately thick neck; the color generally red or brown, though often yellow, black, or spotted. The District of Angeln produces the finest specimens of these cows, which are considered to yield more milk in proportion to the food they require than any other kind. The marsh cows are large-boned, generally red, and require luxuriant pasture. They thrive well in the marshy delta of the Elbe, giving from twenty-four to thirty-two, or even forty quarts, when in full-milk, daily; but the return of butter is much smaller, and of inferior quality to that of the Angeln cattle. The Jutland cow is fine in bone, rather lengthy than deep in body, but not generally long-legged. The usual colors are gray, dun, or black, or either of these spotted with white. They are distinguished for fattening easily, and are not much prized for dairy purposes.

The average quantity of milk obtained from good stock is estimated at from 2,000 to 3,000 quarts per annum, according to the food and care bestowed on the cows. The produce has been calculated thus: every 100 pounds of milk will give 3¼ pounds of butter, 6 pounds of fresh cheese, 14 pounds of buttermilk, (exclusive of the water added before and after churning,) and 76 pounds of whey; and though the different circumstances affecting the cows cause a great variety in the results, still it is considered a fair average that fifteen quarts of milk are required for a pound of butter; for although from some cows a pound may be obtained from twelve quarts, yet others, and even the same cows at different seasons, and with different food, (such as beet, or raw potatoes,) will not produce a pound of butter from less than seventeen or eighteen quarts. On the whole, it is esteemed a fair return, in these Duchies, when the average produce of the dairy amounts to 100 pounds of butter, and 150 pounds of cheese, per cow.